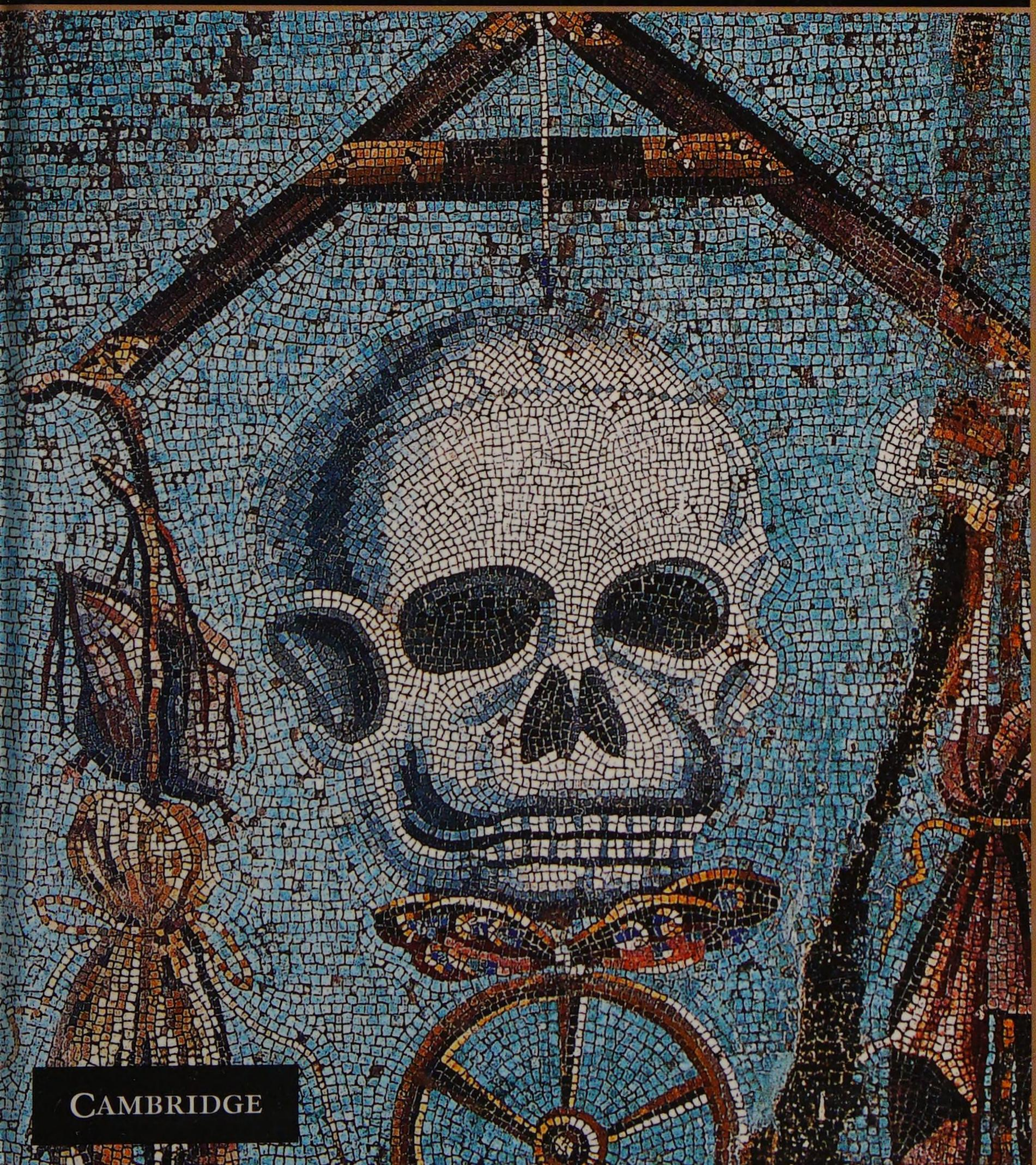
Technology and Culture in Greek and Roman Antiquity

S. CUOMO



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KEY THEMES IN ANCIENT HISTORY

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TECHNOLOGY AND CULTURE IN GREEK AND ROMAN ANTIQUITY

The technological achievements of the Greeks and Romans continue to fascinate and excite admiration. But what was the place of technology in their cultures? Through five case-studies, this book sets ancient technical knowledge in its political, social and intellectual context. It explores the definition of the *techne* of medicine in classical Athens, the development of new military technology in Hellenistic times, the self-image of technicians through funerary art in the early Roman Empire, the resolution of boundary disputes in the early second century AD, and the status of architecture and architects in late antiquity. It deploys a wide range of sources, from technical treatises to philosophical texts, the works of historians and playwrights, as well as epigraphical and archaeological evidence, to reconstruct a dialectic picture of ancient technology, where several ancient points of view are described and analysed, and their interaction examined. Dr Cuomo argues for the centrality of technology to the ancient world-picture, and for its extraordinarily rich political, social, economic and religious significance.

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KEY THEMES IN ANCIENT HISTORY

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Contents

List of figures *page* viii
Acknowledgements ix
Epigraph xi

Introduction 1

1 The definition of *techne* in classical Athens 7

2 The Hellenistic military revolution 41

3 Death and the craftsman 77

4 Boundary disputes in the Roman Empire 103

5 Architects of late antiquity 131

Conclusion 165

Bibliography 169
Bibliographical essay 203
Index 211

Figures

3.1 The Pettii stele *page* 87
3.2 The Verona relief 89
3.3 The 'house-shaped' sarcophagus 90
3.4 The Diogenes plaque 97
3.5 The skull-shaped bronze weight 100
5.1 Mosaic of a building site 136
5.2 Funerary mosaic from Tabarka (ancient Thabraca) 153
5.3 Mosaic of *ktisis* 158

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The book was completed a couple of weeks before my son Kes was born, and is dedicated to him. I hope that one day he will know enough Neapolitan to understand what the verses at the beginning are all about.

'A morte 'o ssaje ched' è? È una livella.
'Nu rre, 'nu maggistrato, 'nu grand'ommo,
trasenno stu canciello ha fatt' 'o punto
c'ha perzo tutto, 'a vita e pure 'o nomme:
tu nu t'hè fatto ancora chistu cunto?
Perciò, stamme a ssentì . . . nun fa' 'o restivo,
suppuorteme vicino – che te 'mporta?
Sti ppagliacciate 'e ffanno sulo 'e vive:
nuje simmo serie . . . appartenimmo à morte!

('*A livella*, Antonio De Curtis)

Do you know what death is? It's a leveller.
Kings, magistrates, great men,
On entering this gate realize
That they've lost everything: their lives and their name too.
So, listen; don't be stubborn
Let the living stage their comedy
Not us, we're serious: we belong to death.

Introduction

> It is not the unanswered but the unasked questions that undermine discourse and give an unbalanced slant to an entire field.[1]

Any historian of ancient science and technology worth her salt should begin this book by trying to persuade the readers that her subject is indispensable to a true understanding of antiquity. For once, the claim is actually true. To state the obvious, one cannot really have an accurate picture of classical Athens without considering the role of *techne*[2] and technicians within it – especially given that they are so central to canonical authors like Plato or Aristophanes. And one cannot plausibly identify Romanization with the provision of infrastructures such as aqueducts or roads, and then declare that technical expertise was not essential to run the Roman Empire. Yet, stating the obvious appears necessary. Indeed, there are two surprising facts about ancient technology. One is how pervasive it was. *Techne*, and its Latin equivalent *ars*, covered an even wider spectrum than modern technologies. Both carpentry and medicine were *technai*; a rhetorician, capable of turning opinions around in the minds of his audience, and a sculptor, capable of turning a block of marble into the statue of a god, both qualified as technicians. Most of the remains, material or literary, that we have from the ancient world were the products of some form of technical knowledge. Once you start looking, there is no getting away from it: you find technology *everywhere* in the ancient world. All the more surprising, then, that the second surprising fact about ancient technology is how few people have been or are studying it.

At the time of writing, the history of ancient technology is still seen as a specialist subject – ironically, too 'technical' to fully enter the mainstream

[1] Mathews 1999: 121.

[2] Throughout the volume I have transliterated τέχνη and retained *ars*, rather than translating them, because the range of meanings covered by these words in Greek and Latin cannot be reproduced by any single modern equivalent, such as 'craft', 'art' or 'skill'. Cf. Meißner 1999: introduction; Balansard 2001: 13–17.

of classics, and too exotic to count as more than a luxury in history of science departments. This volume hopes partially to correct this situation, by showing that ancient technology can provide invaluable insights into ancient culture – indeed, that one cannot understand these two terms, ancient culture and ancient technology, in abstraction from each other. Moreover, I hope the insights we gain into ancient technology and culture may be useful for the historiography of science and technology of later time-periods as well.

Let me explain first of all how this book differs from the extant literature on the subject.[3] Most of the current histories of ancient technology deal chiefly with engineering, while my decision has been at least partly to embrace the ancient span of the terms *techne* and *ars*. This diversity has prevented a single definition of the topic under consideration. Indeed, the whole of the first chapter is devoted to showing how arduous a task that is, and how loaded definitions of *techne* were. *Not* providing a circumscribed, neat definition of *techne* is partly the point I want to make with that chapter and with this book.

Again, most of the extant accounts separate out a description of attitudes to technology from the main narrative.[4] Instead, my emphasis throughout the whole book is on how technical knowledge, activities and products were perceived and represented by the people involved (both practitioners and customers). This makes methodological sense: I do not think that one can separate what we know 'objectively' about ancient technology from ancient attitudes to technology. We might foster the illusion that we are in the presence of objective facts where archaeological evidence is available. Yet, if we want to say anything above and beyond a *prima facie* description of an artefact – be it a water pump, an aqueduct, or a blown-glass vase – we have to rely on *someone's* attitude, perception and representation, even if they are just our own. In fact, attitudes affect even *prima facie* descriptions, as demonstrated by the classification and re-classification of archaeological finds according to shifts in what is deemed interesting or significant about the ancient world. Yesterday's unidentified metal object, relegated for decades to a museum store, may become tomorrow's catapult frame, triumphantly displayed in the main gallery; someone's abacus table is someone else's game-board. As archaeologists know all too well, the

[3] E.g. Hill 1984; White 1984; Traina 1994; Landels 2000. I have derived much inspiration from Schürmann 1991; Greene 1994; DeLaine 1997 and 2000; Wilson 2002.

[4] This is the case for instance in Humphrey, Oleson, Sherwood 1998, an otherwise immensely valuable contribution.

evidence often says little by itself.[5] The same is true *a fortiori* in cases where little or no archaeological evidence is available and we have exclusively to rely on texts.

Thus, my emphasis on how technical knowledge, activities and products were perceived and represented by the people involved is grounded in the fact that, arguably, any evidence we have comes through the filter of perceptions and representations – attitudes – to technology.

Again, I have been perhaps more vocal than previous accounts in my criticism of two approaches which I think have marred the historiography of ancient technology, and are partly to blame for its current state of relative neglect. They are more common among non-specialists (historians of science and technology of other periods and classicists) than among historians of ancient technology of the last generation, as if debate on some issues had moved on within the field, but the message had failed to spread outside of it. I call these two approaches the *blocage* question and the 'mainstream view'.

The *blocage* question originated from a perceived discrepancy between the ancient potential for technological development and this development in actuality. Ancient technology has seemed quite 'advanced'. Archimedes built incredibly accurate catapults, and Hero of Alexandria described a device where boiling water, turning into steam, set a metal ball in motion. Modern observers have wondered why ancient technical knowledge stopped at the production of gadgets or, at most, engines of war, and was not taken further to what were seen as its natural consequences, i.e. the creation of a steam engine. This approach also postulated a certain connection between technology and economy. On the basis of the seemingly obvious equation 'better technology = better economy', and even without invoking the possibility of an industrial revolution, historians have wondered why the ancients seemed so little preoccupied with using or improving technology to increase productivity.

The discussion around these two related issues has been dominated by the notion that something 'blocked' the ancient mind and prevented it from making those connections between technology and economy, or technology and wider applications, that we take for granted. Reasons proposed for this *blocage* include the presence of slaves, a widespread scorn for work and practical applications in general, and the stigma attached to gaining money rather than inheriting landed property.[6]

[5] See Morton 2006, although the situation he describes is more complicated for ancient artefacts than he allows. I thank Tracey Rihll for this reference.

[6] The term *blocage* comes from early French discussions of the topic: e.g. Schuhl 1947; Greene 1994 for bibliography. The question is related to the debate between 'primitivists' and 'modernists' in ancient economy, see Finley 1965; Meißner 1999: 19–20; Greene 2000; Wilson 2002.

As has been pointed out by Kevin Greene,[7] the *blocage* question is badly posed. It rests on premises that we can simply reject: the assumption that technology goes or develops in one direction, thus possessing a context-independent potential that is destined to actualize itself unless something hinders it; the assumption that the relationship between technology and economy is straightforward and, again, pretty much context-independent, unchanged throughout human history – in particular, the assumption that technological progress leads to economic progress ('progress' here seen as susceptible of objective definition). Cast doubt on any of these notions, and the *blocage* question vanishes into thin air.

The second approach is more insidious, and more difficult to describe. By 'mainstream view' I mean the stubbornly common picture according to which ancient technology was marginal to society and economy, its practitioners were widely despised and its activities looked down upon. I call this view 'mainstream' both because a surprising number of people today hold it, and because its supporters maintain that this was the view of most ancient people, or of the people whose views mattered the most. In other words, 'mainstream' refers not just to the present popularity of a certain picture of ancient technology, but also to the fact that such a picture depends on an undemonstrated premise: that some views we can glean from the sources were the majority, the dominant, *the* ancient 'mainstream' attitude to technology.

Now, I think it is a completely open question to what extent technology was marginal in ancient society, and it is an even more widely open question to what extent we can identify a view in a society and call it 'dominant' – even opinion polls today cannot claim to do that. What has in fact happened is that modern historians have selected statements put forward by authors they consider significant (Plato, Aristotle, Xenophon, Seneca) and have held them up as the dominant view on the question of ancient technology, sometimes under cover of the excuse that there is not enough evidence to do otherwise.

A common statement in favour of this selection is that Plato, Aristotle and so on, represent the elite; thus, by definition, they represent the dominant group in society at the time. It is, however, yet another open question to what extent the ideology espoused by the elite is effectively dominant for the majority, even within an Orwellian society.[8] Most likely, there will be instead an on-going, dynamic negotiation between elite and

[7] E.g. Greene 1994.
[8] Debate on this is rife: one can start from Foucault 1975; Bourdieu 1977 [1972].

non-elite views – in other words, a complicated and recalcitrant entanglement of views. Historians who espouse the mainstream view pick out one thread or, if you prefer, one musical line in what is a cacophony of voices, and declare that it is the one worth writing about, or listening to. As I show throughout the book, this at best oversimplifies positions that are not homogenous, not even within one individual author, and, at worst, it privileges their authority over dissonant positions – an operation about which there is raised awareness in areas such as history of slavery or of women, and about which there should be awareness in the history of technology too.

In sum, the 'mainstream view' takes sides in what was effectively a conflict-rife, dialectic, polarized situation. I see nothing particularly wrong in taking sides – we all do – as long as we do not pretend otherwise, or, worse, pretend that there was only one side to the question in the first place.

Finally, many previous accounts opt for a chronologically rather loose but, within the limits indicated above (an emphasis on engineering), thematically comprehensive narrative. Instead, I have opted for case-studies, one for each chapter. Each episode deals with a different type of technology, a different time-period, and tries to experiment with slightly different historiographical techniques. Thus, chapter 1, on medicine, is set in classical Athens, and is a history-of-ideas piece; chapter 2, on military technology, spans the period from the fourth to the first century BC and could be called a historiographical survey. Chapters 3, on carpentry and concentrating on the first century of the Empire, and 4, on land-surveying in the century after that, are examples of what one could do with archaeological and epigraphical sources, respectively. Finally, chapter 5, on architecture, spans a vast expanse of time, from more or less the third to more or less the sixth century AD and is an embryonic attempt at a big-picture history of ancient technology based on the integration of textual and material evidence. I have tried to organize each chapter around a big question; the case-study provides a necessarily limited and qualified answer, but it also hopefully offers some insight into what could be a more general treatment of the issue. Also, I conceived each case-study as a sort of history writing exercise, almost an experiment about what can be gleaned by looking at, or looking for, particular types of sources, or approaching them in a certain way.

Some of these micro-histories will be genuinely micro. When I embarked upon the 'experiments' of chapters 3 and 4, for instance, I thought I'd be hard put to find enough evidence to write anything at all,

but ended up instead having to reduce my focus to the iconography of one technical instrument in chapter 3, and to a forty-year span in chapter 4. Being overwhelmed by the abundance of sources is not a frequent experience in ancient history, and one that deserves emphasis, almost celebration. Micro-histories, some of them with a narrow focus, also mean that each chapter has a lot of potential for expansion: I have suggested some ways of doing that in the conclusion.

The epilogue is also where I summarize my main positive conclusions on ancient technology. This is because they are in fact retrospective thoughts – one never knows what a book is about until after writing it (sometimes not even then). I was able to detect some general features by the end, but I did not have a master plan when I started – rather, I was driven by some unsatisfied curiosities and unsolved puzzles. One such was the mosaic on the front cover, and the connection it seemed to have with a twentieth-century Neapolitan poem on how death makes us all equal, some lines of which serve as epigraph to this book. I discuss the mosaic (not the poem) in chapter 3. Chapters 4 and 5 pretty much originated from wanting to find out more about – respectively – a group of inscriptions in Delphi, and a group of late ancient laws I had looked at for my Ph.D. thesis.

In other words, the whole enterprise has often been no more systematic than asking some unasked questions and seeing where that took me, and I would like to retain a flavour of that experimental approach. I hope the reader will find the resulting investigations intriguing enough to forgive the fact that some of those experiments remain undecided, and several of those questions are only partially answered.

CHAPTER 1

The definition of techne *in classical Athens*

Chained to a rock, the Titan Prometheus remembers how he helped humankind:

> they had eyes but could not see, and ears but couldn't hear. [. . .] They did not know how to build houses with bricks and facing the sun, nor to work with wood. They lived in sunless caves the way ants live in the ground [. . .]. They worked without useful calculations, until I showed them the risings and settings of stars [. . .]. I taught them numbers, the greatest stratagem, and writing, the mother of memory. I yoked beasts for them [. . .] and I harnessed horses to chariots and taught them to heed the rein [. . .]. And it was nobody else who gave humans ships, sail-driven wagons that the sea buffets. [. . .] The greatest was this: when they fell ill, they had no defence – no balm, no ointment, no elixir – and lacking medicine, they wasted away, until I showed them pharmacy so they could fend off various diseases. [. . .] Here's the whole story in a nutshell: whatsoever *technai* the humans have, they got from Prometheus.[1]

Medical images abound in Aeschylus' play: the Titan is said to be administering a drug (*pharmakon*) for humankind's sickness; words are described as the doctors of a diseased temperament; the wandering Io, pregnant with Zeus's child and half transformed into a cow by the jealous Hera, appeals to him for a remedy for her sufferings. On the other hand, Prometheus is compared to a bad doctor who cannot cure his own disease: despite rescuing humans from their brutish circumstances, he is unable to help himself.[2]

In his third *Pythian Ode* (written between 476 and 467 BC), Pindar narrates the story of another figure half-way between human and divine: the miraculous healer Asclepius. His mother Koronis got pregnant by the god Apollo but unwisely went on to betray him with a mere mortal, thus 'chasing the impossible with hopes unfulfilled' (23, is hope a form of *hubris*?). Apollo duly

[1] [Aeschylus], *Prometheus Bound* 463–522 (written c. 430 BC; I will pretend the question of authorship is uncontroversial), tr. Matthews with modifications; cf. Sophocles, *Antigone* 332–75 (c. 442 BC); Cordes 1994: 35–8. Translations are mine unless indicated otherwise.

[2] [Aeschylus], *cit.* 251, 606, 380, 472–5, respectively. Cf. Xenophon (c. 444–357 BC), *Memorabilia* 1.4.13; Vernant 1965b; Kosak 2004: 43.

had Koronis die, but rescued his son from her womb while she was burning on her funeral pyre (39–40). With the centaur Chiron as a teacher, Asclepius went on to become a most successful doctor, but 'even wisdom is given over to gain' (54). Greed pushed him to overstep the mark and he brought a man back from the dead, only to be struck and killed by Zeus's thunderbolt. Pindar takes the opportunity to exhort readers to respect the hierarchy between gods and mortals, and not to think above their station.[3]

From very early on, Greek culture depicted medicine and similar forms of knowledge as ambiguous: they were terrible and wondrous, dangerous but indispensable, the province of the powerful but morally ambivalent.[4] In this chapter I will address the general question, what is *techne*, through the particular example of how medicine was implicitly or explicitly defined as a *techne* in the fifth and fourth centuries BC.[5]

I have chosen medicine as a case-study for several reasons, not least because we have texts by the technicians themselves, i.e. the Hippocratic Corpus.[6] Medicine was well respected, since it procured the greatest good – health.[7] At the same time, as Aeschylus and Pindar show, medicine was the site of moral ambiguity and paradox. Doctors do unpleasant things – cutting, burning, administering foul-tasting drugs – because they know that ultimately they will be good for you. Saving a life sometimes entails going contrary to common sense.[8] Also, medical images abound in the political and ethical discourse of classical Greece – we have analogies between the human body and the 'body politic', the notion that society's evils are like illnesses, and so on. These parallels ran deep because they inscribed political and ethical values onto the body and onto nature itself.[9]

[3] Cf. Pindar, *Pythian Odes* 3.113, *Nemean Odes* 3.4, 3.53–4, 4.1–5, 5.40–3. The odes date to the first half of the fifth century. Cf. also Descat 1986: ch. 2.6; Mackie 2001.

[4] Cf. Anton 1980: 59; Hutchinson 1988: 22–3, 37, 39; Schubert 1993: 138; Cordes 1994: 34–5, and in general 138–69; Balansard 2001: 158–9; Kosak 2004: 36–7.

[5] I will take the period from mid to late fifth to mid-fourth century BC as pretty much a continuum – see Ober 1989: 35–8; Eder 1995.

[6] I will use (albeit sparingly) the Hippocratic *Decorum, On the Doctor* and *Precepts*, which are all Hellenistic or later, on the assumption (formulated by Jouanna 1992: 70, 92) that they reflect an earlier medical ethic. All the other Hippocratic works are dated between the mid to late fifth and the late fourth century BC.

[7] Plato, *Gorgias* 451e3–452b1, 464b1–6, 490b1–7; [Hippocrates], *Ancient Medicine* 1; *IG* II^2 374, 319 BC or later, honours the doctor Evenor with citizenship; Jouanna 1992: 125.

[8] E.g. Plato, *Gorgias* 521a2–7, 521e3–522a7; Aristotle, *Nicomachean Ethics* 1104b16–18; Xenophon, *Anabasis* 5.8.18; [Hippocrates], *Precepts* 5.

[9] Cf. e.g. tyranny as a disease at Plato, *Republic* 544c, 564b, *stasis* as a disease at *ibid.* 557a, politics as the *techne* of curing souls at *Laws* 650b. The literature on this is vast, see e.g. Jouanna 1978, 1980, 1981; Cordes 1994: 19n. 1, 26, 34, 44; Kallet 1999; Lloyd 2003.

Thus, choosing the case of medicine allows us to explore some interesting features which in my opinion characterized ancient discussions of *techne* in general: great usefulness, moral ambiguity, strong political resonance.

Tracing the ramifications of these discussions is not an easy task. For a start, it does not help that the semantic range of *techne* does not match modern equivalents. Essentially the same thing appears to have been variously called *techne*, *sophia* (knowledge/wisdom), *episteme* (rigorous/stable knowledge), or *dynamis* (power).[10] Also, there was debate as to whether some disciplines, for instance rhetoric, were *technai* at all. The Hippocratic *On Techne*, for instance, is a defence against the contention that the *techne* of medicine does not exist.[11] Moreover, there was debate about what role technicians should play in the community, and about the ethical repercussions of what they did.

One particularly important example of this is the well-known distinction between technician (one of the most common words for it would have been *demiourgos*) and 'base technician' (*banausos*). The baseness of the base technician had to do with greed, or the readiness to do anything for money, and was crucially marked by corporeal deformity. For instance, in Xenophon the *banausikai technai* 'spoil the bodies of the workmen and the foremen, forcing them to sit still and live indoors, and in some cases to spend the day at the fire. The softening of the body involves a serious weakening of the mind'.[12] Similarly Aristotle: 'a deed, *techne* or learning must be considered base if it makes the body or soul or mind of free men useless for the uses and actions of virtue. Therefore we call base those *technai* that render the body worse and the activities done for pay'. Or 'the most technical of these activities are those with the minimum of chance, the most banausic those where the bodies are most mutilated'.[13]

[10] See e.g. Plato (c. 429–347 BC), *Charmides* 165c–d, 170e, *Euthydemus* 289a–c, *Gorgias* 447c, 449d, 455d, 456a, *Protagoras* 357b, *Republic* 518d, *Statesman* 258d–260b, 304b; Aristotle (384–322 BC), *Magna Moralia* 1205a, *Nicomachean Ethics* 1153a24–5, *Rhetoric* 1367a32–3; [Hippocrates], *Law* 4.10; Descat 1986: 129; Cambiano 1991: 74–5, 221–6, 231–4; Balansard 2001: 95–118.

[11] [Hippocrates], *On Techne* 1.18; *Ancient Medicine* 1; *Regimen in Acute Diseases* 8; *Precepts* 9; Plato, *Laws* 937e–938a, on rhetoric. Heinimann 1961; Lloyd 1991: 251; Cordes 1994: 101–37; Laskaris 2002: 74 with references, 78–82.

[12] Xenophon, *Economy* 4.2–3, 6.6–8, Loeb translation.

[13] Aristotle, *Politics* 1337b8–18 and 1258b26–35, respectively, *Economy* 1343b2–6, *Rhetoric* 1367a30. Other *loci classici* include Aristophanes (c. 456–380 BC), *Clouds* 1010–23, *Women in the Assembly* 385; Plato, *Gorgias* 512c–d; Xenophon, *Economy* 6.6–8 (but see the story of Aristarchus at *Memorabilia* 2.7); Plutarch (c. AD 45–125), *Parallel Lives. Agesilaus* 26.4–5. But cf. Aeschines (c. 390–314 BC), *Against Timarchus* 27 and [Demosthenes] (c. 384–322 BC), *Against Phaenippus* 20. On these issues Aymard 1943; Isnardi Parente 1966: 21, 24; Burford 1972; Cambiano 1977: 229–32 and 1991: 53–6; Wood and Wood 1978: 54–5, 84, 100–1, 129, 158; Lévy 1979; Vidal-Naquet 1981: 227, 236, *contra* Saunders 1982; Loraux 1982: 172–5; Balme 1984; Kosak 2004: 27, 32–3. Further references in Morawetz 2000: 16–17, see also Pipili 2000, to which one should add Berger 1970: esp. 92–7.

Such statements have often been taken almost at face value. And yet, given the widespread idea that bodily beauty, or the lack thereof, went together with inner goodness or its opposite, statements that link *techne* to a deformed body and its corresponding lack of virtue, must be seen as charged. It ought to be obvious that the aesthetic of depictions of the worker's body depends on what worth is attached to labour: take, for instance, many official monuments of the former Soviet Union, which represent labourers as embodiments of an idealized strong physicality. What is more, in ancient Greece the worker's body was not represented exclusively as deformed. Several vases depict craftsmen naked, in a way that has been interpreted as the reality of their working situation, but could just as well be a case of 'heroic nudity', meant to celebrate the technician's body, rather than expose it to contempt.[14]

In sum, it is doubtful to what extent the distinction *demiourgos*/*banausos* mapped well-defined groups in a way that the technicians themselves would have recognized. *Banausos* and related terms do not appear to have been used very much until the fourth century BC, when their increased use was perhaps a response to the changed political situation and the increasing power of the *demos* in the period from the 450s onwards, after the fall of the Thirty Tyrants. *Banausos* remains a blurry category, conveying not so much an actual socio-economic class, as the opposite of the citizen – the uneducated anti-citizens, the non-*pepaideumenoi*, the non-leisured underclass.[15] It is often said that Athenian democracy relied for its existence on the exclusion of the 'other', the non-citizen – women, slaves and foreigners. This exclusion at the same time constituted the citizen body as 'the same', and thus cohesive. Interestingly, technicians were often assimilated to the 'other' – to women, slaves and foreigners. Although the majority of metics (i.e. legal aliens) and perhaps freedmen were indeed engaged in crafts and commerce (after all, they could not own land), the fact remains that many technicians living in Athens were citizens.[16] The denial of 'sameness' to technicians and the

[14] Burford 1972: 70–1; Ziomecki 1975: 138–9.

[15] Chantraine 1956; Murakawa 1957: outside Athens *demiourgos* denoted magistrates of the highest rank; De Fidio 1971; Cambiano 1977: 229–32, 1991; Nightingale 1995: 55–9; Descat 1986: 146–54; Brisson 1994: 50, 54, 86–97; Morawetz 2000: ch. 1. The term *banausos* occurs only once in Hippocratic texts from our period: [Hippocrates], *On the Sacred Disease* 18 (ed. Jouanna). The text ends with the exhortation not to rely on purification, magic, 'and all such banausic things', the phrase is not in all manuscripts. Cf. Laskaris 2002: 97–108.

[16] [Xenophon] (c. 430 BC), *Constitution of the Athenians* 1.10, 1.12; Pope 1935; Randall 1953; Burford 1969; Berger 1970: 160–2; Ziomecki 1975: 127–35; Whitehead 1977: 16–17, 114–21; Wood and Wood 1978: 29; Ober 1989: ch. 1; S. Morris 1992: 31–3, 57, 90–1, 231–2; Cordes 1994: 60–1; Loraux 1996: 6; Cohen 2001; Harris 2001: 70; Kosak 2004: 76–7.

attempt to assimilate them to the 'other', or indeed to downgrade them as base, is for me an indication of the fact that they were perceived as somewhat dangerous, and I will expand on this point in the conclusion.

So, the main body of this chapter will be devoted to identifying the chief features of *techne* through the example of medicine. In order to do that, I will review and, to some degree, compare and contrast opinions expressed by technicians (the Hippocratic doctors) and non-technicians (mostly Plato, but also Aristotle and Xenophon).[17] I am aware of the essential artificiality of this divide, and of the diversity and complexity on either side of the divide itself. Nonetheless, since one of my aims in this chapter is to question the idea that there is one, or one 'mainstream', notion of *techne*, if I manage to show that, even after ruthlessly homogenizing the views of 'non-technicians' and 'technicians', no unified definition emerges, then injecting further complexity into the picture (such as could be done in a larger study) would only confirm *a fortiori* my argument.

In the end, a general profile of *techne* will emerge, which evidences disagreement between technicians and non-technicians on some key points: the value of experience, the attainability of accuracy, the teachability of *techne*, and the virtue of practitioners. I will try to show that such disagreements reveal wider divergences, which I will connect with the issue of what role technicians should have in the *polis*. I will assume that technicians in classical Athens can be considered a group – especially if they were practising the same *techne*. Apart from the fact that they were criticized as if they were a group, work in classical Athens was not (just) 'an economic function but [. . .] a mechanism of self-definition'.[18]

In conclusion, I will make two suggestions. The first is that there was more than one vantage point on the question of *techne* in classical Athens, so we need to retrieve several voices and engage them in a dialogue. Historians who subscribe to the 'mainstream view' (see the introduction) tend to draw almost exclusively on Plato for their picture of *techne* in classical Greece, and tend to downplay or oversimplify the political import of accounts of this subject, including those by Plato himself. Accordingly, my other suggestion is that, in line with the charged distinction between *demiourgos* and *banausos*, there were political and social implications to taking one position rather than another on the question of *techne*. It may be

[17] [Hippocrates], *Aphorisms* 1.1, *Diseases* 1.1 contain lists of features that I used to structure this chapter.

[18] Cohen 2001: 100. Also Randall 1953; Bettalli 1985; Jori 1996: 109–10. *Contra*, in various ways: Burford 1972: 155–6; Frontisi-Ducroux 1975: 93, 180; Petre 1979; Vidal-Naquet 1981; Whitehead 1977. See Ober 1989, 1998; Schubert 1993 for the *demos*' self-awareness.

striking for the modern reader to see how very often discussions about the definition and status of *techne* were embedded in discourses about ethics and politics. Yet, 'for most Athenians, the shocking "postmodern" conclusion that "all knowledge is political" (i.e. implicated in relations of power) was simply a truism: neither the possibility nor the normative desirability of genuinely apolitical forms of knowledge about society or its members ever entered the ordinary Athenian's head'.[19]

CLASSIFYING *TECHNE*

Most definitions of technical knowledge highlight the fact that it has to do with making, knowing-how rather than simply knowing-that. *Techne* is often linked with *erga*, a wide-ranging word variously translated as 'acts', 'works', 'results', and sometimes seen as the correlate of *logoi* – mere talk, as opposed to facts. In Aristotle *techne* is equivalent to 'a productive habit' (*exis poietike*); 'productive' in the sense that it brings into being something which could equally well not have existed (i.e. is not necessary) and would not exist by nature – something whose existence depends on the maker (the technician). This includes production of the non-tangible: health for the doctor, persuasion for the rhetorician, a proof for the mathematician. Production is a process and the realization of a potentiality, and thus *techne* is often described as a *dynamis* (power or potentiality). This allows Aristotle a parallel with ethics, because in his view we acquire virtues by realizing them, just as, for instance, we become builders by building. Thus, medicine is acquired through experience, and not (only) textbooks.[20]

And yet, in Plato's *Gorgias*, Socrates detaches true (as opposed to false) *techne* from deed (*pragma*), practice (*tribe*) and even experience (*empeiria*), and emphasizes rather the importance of *logos*, seen principally as knowledge of the causes relative to a field of activity.[21] Plato also praised those

[19] Ober 1998: 34 (quotation), 36–8. See e.g. Aristotle, *Nicomachean Ethics* 1105a7–26; Xenophon, *Memorabilia* 1.7.2–3, 4.2.11; Isnardi Parente 1966; Lloyd 1968; Jaeger 1975; Jouanna 1978; Annas 1982: 25; Cambiano 1991; Nightingale 1995: 21; Roochnik 1996.

[20] Aristotle, *Nicomachean Ethics* 1097b24–33, 1103a32–1103b2, 1140a1–16, 21–2, 1168a7–8, 1180b31–1181a2, 1181a19–1181b3, *Politics* 1286a13–4 (probably based on Plato, *Statesman* 299d). Cf. Plato, *Gorgias* 450b–c, 514a–e, *Laws* 920e, *Laches* 185e; Xenophon, *Memorabilia* 2.7.5; Isocrates (c. 436–338 BC), *Antidosis* 205. On *ergon* see Descat 1986; Balansard 2001.

[21] Plato, *Gorgias* 449c–450b, 451e–452b, 462b–c, 463b, 465a, 500e–501b, 503d–504a, cf. also *Phaedrus* 270b, *Republic* 510a, 515c; Aristotle, *Nicomachean Ethics* 1094a1–2, 1097a19, 1102a18–23, 1152b19; Adkins 1973: 6; Jouanna 1992: 257–8; Cordes 1994: 170–84; London 2000: 133; Balansard 2001: 139–59. On the issue of *empeiria*, Aristotle may be responding to Plato when he approvingly quotes Polus (one of the characters in the *Gorgias*) to the effect that 'experience has made *techne* while inexperience chance': *Metaphysics* 980b26–981a6. Hutchinson 1988: 27, 45; Cambiano 1991: 78.

technai where practice was supported by mathematical reasoning, and established hierarchies where the value of a *techne* was directly proportional to its abstractness. In the *Philebus*, the art of building employs measures and instruments, so it achieves great accuracy, which makes it 'more technical' than, for instance, medicine, whose use of quantification we know from the Hippocratic Corpus to have been scanty and keenly debated.[22] Again in an attempt to produce a sort of taxonomy of technical knowledge, the *Republic* distinguishes the *techne* of the user, that of the maker, and that of the imitator. A good deal of this dialogue is spent criticizing imitative practices, so unsurprisingly the *techne* of the imitator is the lowest of the three. The maker is in his turn subordinated to the user: the former is endowed only with correct opinion, whereas the latter has *episteme* of the object, like the flautist compared to the flute-maker.[23] But is Plato effectively saying that the shoemaker knows less about shoes than any of his customers? That the patient knows more about health than the doctor? The fact that Plato (and Aristotle) accord priority to the user is suspicious, because it deprives the maker – the technician – of the privileged position he occupies by virtue of his expertise, and reduces him to the rank of a layperson, or, indeed, worse.

In *Metaphysics* A, Aristotle puts forth his own hierarchy of forms of knowledge, which is also a hierarchy of the people possessing such knowledge. Thus, those who merely have sensations (animals, although for Aristotle even animals have memory and experience) are inferior to the man of experience, and he is in his turn subordinated to the technicians (*technitai*). The rationale is that, although when it comes to actions experience is not different from *techne*, and *techne* is acquired through experience, unlike experience *techne* has knowledge of the universal and can be taught. In fact, the very teachability of *techne* makes it an *episteme*. One step above technicians (now called *cheirotechnoi*, with an emphasis on manuality), are master technicians, *architektones*, who (in harmony with Plato here) know the causes and do things according to the *logos*. Aristotle's hierarchy is topped by speculative forms of knowledge, which prevail over productive, technical ones.[24]

A kind of corollary feature of *techne*'s productivity is its artificiality. Indeed, we often find *techne* in connection with *mechane* – an artifice,

[22] Plato, *Gorgias* 448c8, *Philebus* 55c–d, *Sophist* 219a–221b, 265a–268d; *Statesman* 287d–289a. Cf. Lloyd 1987.

[23] Plato, *Republic* 601d–e; cf. *Euthydemus* 289a–c, *Statesman* 281d–e; Aristotle, *Economy* 1343a5–7, *Politics* 1256a4–8; Cambiano 1991: 154–5.

[24] Aristotle, *Metaphysics* 981a13–982a3, cf. *Politics* 1282a3–8.

device or ruse. One of the rare occurrences of *techne* in classical inscriptions is in the formula: so-and-so (usually a community allied with, or subject to, Athens) is not going to harm so-and-so (usually Athens) through words, deeds, *techne* or *mechane*.[25] The products of *techne* would not exist without a specific, goal-directed, intervention on a pre-existing nature. The technician creates something that was not there before, something that does not come into being – or, for that matter, decay – in the same way as a flower or a kitten. Most ancient authors also agree that there is a strong historical dimension to *technai*: they were each discovered at some, often very remote, point in time, and they change over time.[26] In Plato's *Timaeus* the universe itself is the product of *techne* through the action of the divine craftsman or Demiurge. As for Aristotle, he states that nature and virtue are more accurate and better than any *techne*.[27]

Now, if we turn to the Hippocratic treatises, some subtle discrepancies emerge. For a start, *techne* emerges as an activity quintessentially combining doing and thinking, although with an inclination for the former. That the doctor has to learn from experience is a given.[28] The very existence of a *techne* is proved by the fact that it is seen and known, and identified by making things (*erga poiein*). Deeds are sometimes favourably contrasted with *logoi*, not least because the multitude, or general public, will require more tangible proof of expertise from a doctor than just his words.[29] *On Breaths*, while claiming that doctors understand (more than the layman) some *erga* of the intellect and not just of the body, reminds the reader that when it is necessary to apply one's hands (*cheirourgesai*), 'habit (*ethos*) turns out to be the best teacher'.[30] Indeed, quite a few treatises emphasize the manual dimension of medicine – according to the opening of *Diseases* I, knowing the difference between dexterity and the lack of it is one of the basics for a good doctor.[31]

[25] *IG* I^3 39, 40, 83, 247, dating between 460 and 420 BC. Outside Athens the same phrase in a treaty between Thasos and Neapolis: Bengtson 1975: number 204 (after 411 BC). The expression '*techne* or *mechane*' could be hendyadic (two words to express only one concept). An implicit distinction between *techne* and *mechane* in Plato, *Gorgias* 459b, d. See also Sophocles, *Antigone* 332–75.

[26] Plato, *Greater Hippias* 281d; Aristotle, *Nicomachean Ethics* 1098a25–6; Thucydides (c. 460?–400? BC) 1.71.3.

[27] Aristotle, *Nicomachean Ethics* 1106b14–15; Isnardi Parente 1966: 12, 48–50; Brisson 1994: ch. 1; Cambiano 2002; Schiefsky 2004.

[28] E.g. [Hippocrates], *Fractures* 1–2, *Law* 1.9–14, *On Joints* 10, *Precepts* 1–2; Heinimann 1961: 115–16; Knutzen 1964: 1339–43. This clashes with Roochnik 1996: 107. On experienced women as informants on their medical condition, see King 1998: ch. 2.

[29] [Hippocrates], *On Techne* 2.1–18, 14.6–10; Knutzen 1964: 1333–8; Jori 1996: 156–8.

[30] [Hippocrates], *On Breaths* 1, cf. *On Joints* 33; Jouanna 1992: 93–4.

[31] [Hippocrates], *Diseases* 1.1.

Several Hippocratic authors insist on two features that do not get much of an airing in the philosophical texts surveyed above: the fact that medicine, and *techne* in general, are about taking decisions, and the ability of the doctor to account for his decisions – what some texts equate with a knowledge of causes. For the author of *On Techne*, the existence of correct and incorrect courses of action constitutes almost a necessary and sufficient condition for the existence of *techne* itself. The doctor can distinguish bad from good cures, and praise or blame various components of a regimen: 'mistakes, no less than benefits, are witnesses to the existence of the *techne* [. . .] how, where the right and the not-right each have a boundary, could there not be a *techne*?'[32] In *Ancient Medicine*, it is a hallmark of medicine that the truth or falsity of its statements can be ascertained, in contrast to what is unclear and insoluble, and is thus formulated in terms of postulates and hypotheses.[33] Precisely because expert decisions must be based on knowledge not only of the correct, but also of the incorrect, *On Joints* reports procedures that went wrong, and strives to explain why they went wrong.[34]

This emphasis on the capacity to account for a course of action – to give causes or reasons – is shared by many Hippocratic authors, yet some have a more deterministic view than others. According to *On Techne*, nothing is spontaneous: everything in the domain of medicine happens for a reason. The existence of causal connections, readable through signs, is what allows doctors not only to take decisions, but also to make predictions. The fact that sometimes we are not able to discern a cause does not mean that there isn't one; in fact expertise in the individual or progress in the discipline as a whole are signalled by the capacity further to unravel this aetiological fabric. *Epidemics* 1 is more ambiguous – correlations of signs may allow predictions, but they do not necessarily reveal an underlying, stable causal structure, and predictions are not infallible. When reading signs, the doctor can forecast at best what is most likely. Particularly thorny is the determination of the cause of diseases – *On Breaths*, although written rather confidently to explain that breaths/airs are the principal cause of all diseases, states: 'one takes decisions about the most obscure and difficult diseases more through opinion than *techne*; in this lies the greatest difference between experience and inexperience'. Again according to *On Techne*, knowledge (here *episteme*) of the cause distinguishes the patient from the doctor. But *Ancient Medicine* exhorts experts to share their knowledge with

[32] [Hippocrates], *On Techne* 5.8–35, quote 22–32; Heinimann 1961; Cambiano 1991: 36.
[33] [Hippocrates], *Ancient Medicine* 1. [34] [Hippocrates], *On Joints* 47.

the patients, explaining in simple terms what has happened to them. This so that doctors do not 'miss reality'.[35]

On the issue of artificiality, the Hippocratic treatises seem to juxtapose, rather than oppose, nature and *techne*. For instance, some methods of reducing dislocated limbs or looking after fractures are labelled 'according to nature' (especially when they involve traction), some 'almost' so, and some are not according to nature at all – but no strong value judgement accompanies the distinction. That some procedures are 'artificial' does not mean that they should not be used if necessary. In fact, to have a machine and not make proper use of it is wrong: 'it is shameful and un-technical not to devise how to work devices'. Thus the doctor must be able to deploy both natural and artificial means to reach his aim. According to the author of *On Techne*, 'where we may prevail with natural or technical instruments, there we may be technicians (*demiourgoi*), but not otherwise'.[36]

The question itself of what is and is not natural is revealed not to be straightforward. For instance, what is the right position for a patient to assume when his broken limb is immobilized for mending? Each limb will have a position at least approximating its rightest nature (*dikaiotate physis*) – being able to find it marks the expert doctor from the inexpert one. But in the case of deformities like club foot, it is the untreated condition that is considered against nature, and the doctor's intervention is a return to the natural state.[37]

The idea that medicine works *with* nature is quite common. According to *Epidemics* 4, 'natures are the doctors of diseases. Nature discovers the ways by herself, not from thinking. [. . .] A well-educated nature, purposely not learning, produces the necessary'. The doctor is implicitly presented as nature's aid, for instance facilitating a crisis, and thus a resolution of the patient's conditions.[38] For the author of *Regimen* 1, 'all *technai* have something in common with the nature of man', and 'nature is the same as medicine'. Technical activities for him parallel what happens in the body (e.g. cooking is similar to digestion) or even imitate the revolution of the universe, and are in that the visible manifestation, divinely ordained, of

[35] [Hippocrates], *On Techne* 6, 7.18–20, 11.16–24, 14.1–3, *On Breaths* 1, *Ancient Medicine* 1, 2 (quotation), 4, 23, *Epidemics* 1.11, 1.23, cf. *Prognostic* 1. On reading signs in Hippocratic medicine, see e.g. di Benedetto 1986: ch. 5; Jori 1996: 311–12; King 1998: ch. 2; on signs in Aristotle and later, see Allen 2001.

[36] [Hippocrates], *On Techne* 8 (quotation), *On Joints* 2–3, 42, 70, *Fractures* 15, quotation at 30 (the pun is untranslatable), *Regimen* 1.2, 2.61. Cf. Michler 1962; di Benedetto 1986: ch. 14.

[37] [Hippocrates], *Fractures* 1–2, *On Joints* 62, cf. *On Breaths* 1, *Precepts* 9; Knutzen 1964: 1348; di Benedetto 1986: 252.

[38] [Hippocrates], *Epidemics* 6.5.1. Cf. di Benedetto 1986: 117.

invisible processes. It is because of this harmony between *techne* and nature that medicine is able to observe the invisible on the basis of the visible, through a reading of signs that in its turn depends on expertise.[39] Sometimes, when the doctor tries to make a diagnosis, nature does not yield information of her own accord. In that case, medicine can compel and constrain nature, without harming her, and then proceed to the necessary reading. In this context, *techne* is characterized as power, struggle, prevailing, mastering.[40]

Some of the Hippocratic authors introduce a temporal dimension to the relation between man and nature. According to *Ancient Medicine*, medicine has progressed over time, and will make the remaining discoveries in the future. It is then necessary for the doctor to absorb this patrimony of accumulated knowledge, which includes the realization that the healthy need a different diet and lifestyle from the sick. The author suggests that initially humans ate the same things as animals, but then discovered a different regimen, which involved the use of cereals and experimenting with food. This type of research can rightly be termed medicine, because 'it has been discovered for the health, salvation and nourishment of the human being'.[41]

Let us summarize so far. We have shown that, while there was consensus between technicians and non-technicians on some features of *techne* (namely, that it had some relation with experience), complications emerge when we want to pin down a definition of *techne* shared by everyone involved. To the extent to which taxonomy is a form of control, Plato's and Aristotle's hierarchies can be seen as attempts at controlling *techne* through definition. They both arrange technical knowledge along a spectrum dominated by values that were important to them (abstractness, marked by the use of a certain type of mathematics, for Plato; knowledge of the causes for Aristotle), but not necessarily to the technicians themselves. The Hippocratic authors were definitely ambivalent on the topic of mathematization (as we shall see later) and of knowledge of the causes, and instead emphasized some pragmatic aspects of their knowledge: for instance, its capacity to take decisions and its manuality. Notice how in the Hippocratics the balance between maker and user, doctor and patient, is skewed with respect to that proposed by Plato: the maker (of health, i.e. the healer) is in a superior position to the user, although on the face of it the

[39] [Hippocrates], *Regimen* 1.2, 11–24, quotation 24, 15, respectively.
[40] [Hippocrates], *On Techne* 8.13–16, 11.1–16, 12.12–15; Jouanna 1992: 342–3, 347.
[41] [Hippocrates], *Ancient Medicine* 2, 3 (quotation), 4, 8, 14, cf. *Prorrhetic* 2.4.

user (the patient) would appear to enjoy privileged access to knowledge of his own body. Instead, with some qualifications, patients are deprived of privileged access to their condition by the doctors, who, by expertly reading signs, know about the invisible state of bodies more than the patients themselves. As for the wider significance of *techne*, we find the belief that its progress has accompanied, if not downright caused, the development of humankind from a brutish to a more civilized state, just as in Prometheus' story.

TECHNE AND LUCK

Can *techne* attain certainty, or is it bound by the inevitable presence of an element of chance (*tyche*)? Technical knowledge is often described as conjectural or stochastic – literally, able to hit the target. The target in question is identified with the right moment or opportunity (*kairos*), which cannot be defined in advance but must be sought constantly, and varies from case to case. The stochastic character of *techne* is then the result of its constant negotiation between general principles and individual situations.[42]

As we have already seen, the classification of *technai* in Plato's *Philebus* depended on their various degrees of accuracy and mathematical content. Music, medicine, agriculture, the art of the pilot and that of the general, unlike building and arithmetic, all contain an element of chance. Take mathematics away, and you are left with experience and *stochastike*. In fact, for Plato this stochastic quality if anything makes a form of knowledge *less* technical.[43]

Aristotle, on the other hand, sees the conjectural character of *techne* as a good illustration for his account of virtue. Questions about moral behaviour and medicine are similar, in that neither has a firm answer: they are in the realm of the 'for the most part', the not-fully-determinate and the unclear. Ethics is not exact – just as for the doctor or pilot, to act ethically one must keep an eye on the *kairos*. To some extent, then, *techne* is at the mercy of chance – and yet, perhaps chance in its fluidity is what creates opportunities, and fits the dynamic character of both technical and ethical knowledge. Aristotle quotes the tragic poet Agathon to the effect that

[42] Plato, *Gorgias* 463a7–8; Wehrli 1951: 182; Cambiano 1991: 228–9. See Isnardi Parente 1966: 167–77 for stochastic knowledge in Aristotle and Ierodiakonou 1995 for stochastic knowledge in Galen and Alexander of Aphrodisias.

[43] Plato, *Philebus* 55e–57d, *Gorgias* 448c6–7, *Statesman* 284a–e, 285a. Cf. Aristotle, *Nicomachean Ethics* 1104a11–14, 1106b12–13; Xenophon, *Memorabilia* 3.9.15; Isnardi Parente 1966: 54.

techne and *tyche* are fond of, or have an attraction to, each other.[44] The presence of chance also helps Aristotle explain how technical knowledge is formed, 'when one universal notion about similar things is produced from many empirical considerations' – one acquires not just knowledge of this or that thing, but a universal framework within which to inscribe individual cases. Thus, a doctor looks not at the overarching idea of the good, not even at health in general, or human health in general, but at the health of the specific human being in front of him.[45] Aristotle, however, also makes clear the difficulties of attaining knowledge of the single individual: 'no *techne* examines the individual, for instance in medicine what is healthy for a Socrates or Callias, but what is healthy for a such-as-this or such-as-those (for this is technical, whereas the individual is unlimited and not subject to knowledge)'. The accuracy of medicine, then, consists not in following rigid rules, but in finding the right fit between general principles, which are necessary if, for instance, the doctor must be able to account for his decisions, and the individual cases for which treatment is to be prescribed. It is characteristic of *techne* that this balance is not fixed, but constantly negotiated.[46]

In the Hippocratic Corpus we find different positions on whether the complete elimination of chance is feasible, or even desirable.[47] The possibility of discovering the correct, detailed, regimen or treatment for each individual is seen as an ideal, sometimes formulated in quasi-mathematical terms, sometimes posited as unreachable. Portentously accurate predictions are viewed with scepticism by the author of *Prorrhetic* 2: 'the so-called exactness (*atrekeia*) about exercises and exertions [. . .] I believe does not exist, but, if someone believes it, I do not oppose his belief'. Claims to absolute accuracy are often presented as the mark of bad doctors or even quacks: the real expert is aware of his limits.[48] Again, *Diseases* 1 states: 'it is not possible to know accurately and to get completely right the time in which [a patient] dies, be it long or short', and recognizes the inevitability

[44] Aristotle, *Nicomachean Ethics* 1099b19–24, 1100b35–1101a5, 1104a1–5, 1104a7–10, 1112b2–12, 1140a17–20. Detienne and Vernant 1974: 223–4, 311–13; Cordes 1994: 21–3, 88–91, *contra* Kosak 2004: 23.

[45] Aristotle, *Metaphysics* 981a6–8 (applied to medicine at 981a8–13), cf. *Nicomachean Ethics* 1097a11–14, 1180b13–28, 1181b3–6, *Economy* 1344b9–11, *Politics* 1288b10–22; Plato, *Protagoras* 334a–c, *Timaeus* 83c; Jaeger 1957; Isnardi Parente 1966: 136–7; Lloyd 2003: 182, 185.

[46] Aristotle, *Rhetoric* 1356b28–31, cf. also *Nicomachean Ethics* 1141a9–12.

[47] Hutchinson 1988: 37; Lloyd 1987: 114–31, 247–84, 1991: 258; Trédé 1992: ch. 3; Schubert 1993: 130–2; Cordes 1994: 93–5; Jori 1996: 266–9; Roochnik 1996: 38–57; King 1998: ch. 2; Kosak 2004: 33–4; Schiefsky 2005: 9–13, appendix 2.

[48] [Hippocrates], *Prorrhetic* 2.3.

of fortune, both good and bad, in all those cases when the doctor administers a remedy for a condition, and inadvertently either cures or worsens an underlying condition of which he was not aware.[49] Having listed all the factors that the doctor has to take into account in order to determine a patient's regimen, including the risings and settings of the stars, *Regimen* 1 warns:

> even when all this is discerned, the discovery is not sufficient. If indeed in addition to these one discovered for the nature of the individual the proportionate numerical measure of food to exercise, with no excess either of too much or too little, one would have accurately discovered health for humans. Now, however, although all the things previously mentioned have been discovered, this is impossible to discover.[50]

Diet prescriptions are the case at hand for *Ancient Medicine* too, which distinguishes exactness (*atrekeia*) from accuracy (*akribeia*) – the former is more difficult to attain, and almost seen as the eventual end-point of the temporal progress of *techne* from ignorance through the present day to the future.[51]

Some authors are more optimistic. Even with qualifications, for the author of *Prognostic* in the majority of cases signs indicate the same things across geographical regions and periods of time, enabling doctors to formulate correct predictions as long as they take enough signs into account, know enough about them, and carefully consider their interaction.[52] The most sanguine statements about *techne* and *tyche* are found perhaps in *On Techne*. The author is adamant that even those people who appear to have been cured by chance, without a doctor, have in fact unwittingly been using technical knowledge. In other words, medical *techne* exists almost independently of human actors: what we call chance is just *techne* incognito, as it were. More than denied altogether, the role of chance is reduced to a fluke: the great majority of cases exhibit regularities, with good treatments leading to recovery and bad treatments to death or permanent damage.[53]

[49] [Hippocrates], *Diseases* 1.8, 16. [50] [Hippocrates], *Regimen* 1.2, 3.67, 3.69, 4.93.

[51] [Hippocrates], *Ancient Medicine* 9, 12, cf. *Epidemics* 6.8.25–6; Xenophon, *Memorabilia* 4.7.9; di Benedetto 1986: 198; Schiefsky 2005: 203–5.

[52] [Hippocrates], *Prognostic* 25.

[53] The requirement in *On Techne* that a treatment should only be administered when there is the concrete possibility of success of course skews the statistics, as it were, in the doctor's favour. [Hippocrates], *On Techne* 3.8–10, 4.4–11, 9.13–15, but cf. 5.1–8. Cf. di Benedetto 1986: 92 for parallels in Egyptian medicine; Jori 1996: 168–76, ch. 12.

The fullest embodiment of the Hippocratics' ambivalence on the issue of accuracy is arguably *Places in Man*, which contains both pessimistic and optimistic statements. We have:

> it is impossible to learn medicine quickly because it cannot possibly have any fixed way of dealing with things [. . .] medicine does not produce the same now and an instant after, and in the same case it produces opposite things, and these opposite to one another. [. . .] Medicine has a small *kairos*, and the person who has certain knowledge of this is fixed as far as that is concerned, and his knowledge is certain [. . .] that other things turn to their opposites, and that the most opposite things are not the most opposite.

Then again, only paragraphs later:

> the whole of medicine as it is, is, I believe, already discovered, as it teaches in each case both what is customary and the right moments (*kairous*). For a person who knows medicine in this way waits the least for luck (*tyche*), but would do well with or without luck. For medicine has been entirely established, and the most beautiful of the methods devised in it appear to need luck the least. Chance rules itself and is not governed, and it does not come through prayer; but knowledge is governed, and has good luck whenever the person who has knowledge uses it.[54]

The way one handles chance, then, makes the difference between good and bad doctors. If everything were ruled by *tyche* there would be no distinction: chance is egalitarian, as it were.[55] Thus, the fluidity of *techne*, which leads to conflicting views on its accuracy, also helps constitute expertise. Most treatises specify that the doctor must be able to move comfortably between general and particular, and must be able to recognize the *kairos*. A diagnosis comes from a number of factors, including reading signs and 'learning from the common nature of all and the particular nature of each'.[56] *Airs Waters Places* instructs the doctor who arrives in a new town gradually to learn about the climate and its effects on health and disease, so as to be able in the course of time to make predictions about individual cases. Here knowledge of the *kairos* is quite specifically to do with the time-conjunctures linked to seasons or changes in the weather.[57]

[54] [Hippocrates], *Places in Man* 41, 44, 46. The text contrasts learning medicine and learning how to write: for a similar contrast see Isocrates, *Against the Sophists* 12; Roochnik 1996: 74–5.

[55] Cf. [Hippocrates], *Ancient Medicine* 1; Cordes 1994: 89; Villard 1996: 398.

[56] [Hippocrates], *Epidemics* 1.23, cf. *On Techne* 7.12–17, *On Joints* 11, 58, *Precepts* 1–2. Not everything will work for every person: [Hippocrates], *Ancient Medicine* 5–6, 20, *Epidemics* 6.3.12, 6.7.3, *Fractures* 33, *Regimen in Acute Diseases* 3, 43; di Benedetto 1986: ch. 6; von Staden 2002.

[57] [Hippocrates], *Airs Waters Places* 2.

Capturing the right time is of the essence in treatment, and medicine is represented as almost running a race against the disease. With fractures, for instance, there are time windows when treatment is more or less beneficial, and times when it does more harm than good. Knowing the difference pertains to someone who truly is an expert. In *Places in Man*, it is almost like finding the balance on a set of scales: a minimal difference in the quantity of remedy administered or the time of treatment can cause the opposite of what the doctor is trying to achieve. For many, indeed, 'time is that in which there is opportunity, and opportunity that in which there is not much time. Healing takes place with time, but sometimes also with opportunity'.[58]

Thus, compared to modern notions or to characterizations of *techne* such as we find in Plato's *Philebus*, the doctors' notion of accuracy or precision is not really mathematical in its essence. More than a question of conformity to a stable rule or measurement, accuracy is in the amount of detail the doctor manages to formulate, and especially in his ability to capture just the right moment for treatment. Given that medicine is explicitly presented as a semiotic, accuracy is also a matter of learning to read, connect and be sensitive to the various configurations of signs.

In conclusion, despite Plato's negative evaluation of the stochastic quality of *techne*, it would appear that the medical authors *embrace* the fact that chance and imperfect fit with the ideal are, in one form or another, part and parcel of their knowledge. Indeed, Aristotle singled out this feature as paradigmatic of *techne* in his discussion of ethics. In fact, the good management of chance, which is linked to the recognition of the individually variable *kairos* and to the successful negotiation between general principles and individual case, turns into a strategy for differentiating the expert from the non-expert, the real doctor from the quack.

TECHNE AND TEACHABILITY

Is someone born a technician, or does he become one?

A revealing, if indirect, answer is in Plato's *Republic*, dedicated, as is well known, to an account (among other things) of the ideal state. Socrates establishes that the origin of a *polis* is need, and need is met first and foremost by technicians – farmers, builders, weavers, shoe-makers. As the city grows and moves on from its original simplicity, trade takes off,

[58] [Hippocrates], *On Techne* 11, *On the Doctor* 3, 13, *Diseases* 1.5, *Fractures* 31, *Places in Man* 44, *Precepts* 1, *Regimen* 1.2, *Regimen in Acute Diseases* 20.

merchants settle in, an *agora* is built. The increasing luxury brings in its wake *technai* that are not about necessity but about pleasure: hunting, painting, poetry. Eventually, the wealth of the city provokes such envy among its neighbours that it becomes necessary to defend it: the *techne* of war is born, and the soldiers' class constituted. Even the activity of the guardians is initially described by Socrates as including *techne*: he introduces the idea that 'each [person] is not entirely similar to another, but different in nature, one for doing one thing, and another another. [. . .] more of each [thing] is produced, and more beautifully and more easily when one does one thing according to nature and at the right moment, and at leisure from other business'.[59]

In charting the development of the *polis* and of the *technai* associated with its various stages, it is interesting that medicine, described by the Hippocratics, but also by the playwrights, as one of the most seminal forms of knowledge, is not classified by Socrates as necessary. Instead, it is paired with attendance of law courts as evidence of a sort of civic malaise: if men knew how to manage themselves both in mind and body, neither physicians nor juries would be necessary.[60] Serious conditions, such as wounds and seasonal illnesses, rightly require medical assistance, but the 'ingenious children of Asclepius' deal with trifles, for which they even have to invent new names, and try to prolong life at any cost, even if the sole result is a painful old age or a drawn-out struggle with death. Socrates pits this unnecessary medicine against the older medical tradition, embodied by Asclepius himself, who chose to use only necessary medicine 'because he knew that for all well-governed peoples there is a work assigned to each man in the city which he must perform, and no one has leisure to be sick and be doctored through his life'. The example given is that of a sick builder, who wants a quick cure so he can go back to work, but would prefer death to any long treatments that would prevent him from living his normal life, i.e. working. Asclepius, Socrates comments, was *politikos*. His *techne*, we may add, aims not just at health but at a socially defined health – at the maintenance of a certain order.[61]

[59] Plato, *Republic* 369c–d, 370b–c, 374b–e, 395c, 421c. The distinction into three groups is not exclusive to Plato, or to the *Republic*: see e.g. Plato, *Timaeus* 24a–b, *Critias* 110c; Isocrates, *Busiris* 15–27. See also Vernant 1965c: 252–4.

[60] Plato, *Republic* 371a–c, 373b–c, 374a, 405a: physicians and judges are appropriate for the care of the base and the manual workers, not of free men, 425e–426c.

[61] Plato, *Republic* 405d, 406a–c (quotation, Loeb translation with modifications), 406d–407e, cf. *Timaeus* 89c; [Hippocrates], *Ancient Medicine* 3, *Regimen* 3.69; Cambiano 1977: 228 and 1991: 150; Lloyd 2003: 179.

The ideal *polis* involves the strict regulation of both *technai* and their practitioners. It is up to the guardians to decide what products are allowed and what not, what rhythms can be used in music, what edifices can be built. Although some redistribution of wealth is required in order to avoid discontent, mobility should be curtailed. *Demiourgoi* in particular should be neither rich nor poor, but crystallized in an in-between status that allows them to continue in their activity, and that alone.[62] Indeed, justice is defined as doing one's own thing, without overstepping one's boundaries. Mixing different technical activities in moderation is tolerated, but

> suppose a technician or someone else with a money-seeking nature excited by wealth or by the multitude or by strength or something like that tries to go into the class of the soldiers or one of the soldiers into the group of the counsellors and guardians, without being worthy, and they exchange their instruments and their honours with each other, or when the same man tries to do all these at once, then, I suppose, you too believe that this exchange and multi-activity is the ruin of the city.

'Exchange' and 'multi-activity', key words for social mobility, are here linked by Socrates to technicians, but also to injustice and generalized disaster.[63]

In the *Republic*, one person should not be master of more than one *techne*. At the same time, a person's position in the community is determined by the task they perform (by their *techne*), which is then revealed to be the single most important fact about their life. It will even determine their specific share of happiness.[64] When Plato compares the tripartite city to the tripartite soul, technicians are identified with a multi-headed beast, the part of the soul most prone to base passions, including greed. Since the beast knows not what is good for it, we are told in no uncertain terms that it is better for the weak man to be the slave of the best man.[65]

The question is then, who is to decide who practises what *techne*? And here the issue of teachability is crucial: according to the *Republic*, it is

[62] Plato, *Republic* 401b–c, 421d, 422e–423a, 551d.

[63] Plato, *Republic* 433a–434c, quotation 434b, cf. 443c, *Timaeus* 82a–b, 83b, e; Jouanna 1981; Schubert 1993: 158–72; Kosak 2004: 121–5 on the significance of *metaballein* ('exchange') and related terms in medicine and political thought. On *polypragmosyne* ('multi-activity') see Ehrenberg 1947 and Ober 1998: 211–12.

[64] Plato, *Republic* 397e, 423d, *Euthydemus* 272b–c, *Lesser Hippias* 368b, *Lovers* 135c–137b. Cf. Xenophon, *Economy* 4.1; Isocrates, *Busiris* 16–17. Randall 1953; Burford 1972: 86, 99–100; Wood and Wood 1978: 134; Ober 1998: 221: the principle of one person/one function 'renders an Athenian-style democracy impossible ab initio'.

[65] Plato, *Republic* 415c, 423d, 522b, 532c, 547b, 581c, 590c–d. Cf. *Cleitophon* 407e–408b, *Laws* 741e–742a, 743d. Wood and Wood 1978: 144; Loraux 1981: 188–9; Dawson 1992: ch. 2; Balansard 2001: 291–5. I disagree with Euben 1997: 207.

nature and not education. Nature is a necessary, but not a sufficient, condition for the realization of one's 'professional' identity. Education will not give a philosophical nature to those who were not born with it, but without the right training even a philosophical constitution may go awry. Minor virtues can be acquired through habit and practice, but the highest virtues, e.g. wisdom, are given by nature, or even through divine agency. So education is not so much about giving a person what they do not have already, as in making sure that they do not squander their gifts.

While education is necessary to develop one's nature, it is therefore nature and not education that decides where a person stands in the city.[66] Conversely, a *techne* is essentially not something one learns, but something one is born for, if not born with. Socrates couches this in a myth according to which people sprang from the earth with ready-formed metallic constitutions: gold for guardians, silver for soldiers and iron and bronze/copper (*chalkon*) for farmers and the other technicians.[67] The myth is described as a *mechane*, a ruse, and also as a lie, albeit a therapeutic one – a kind of useful drug administered by the guardians of the city. *Pharmakon* is a drug but also a poison, and Socrates is keen to highlight the potential danger of disguising the truth. The analogy is inevitable: the rulers of the city, just like doctors, are the only people allowed to lie for a good purpose.[68]

But why is the lie necessary? And what truth is it meant to hide – why is the drug also a poison? There must have been something hard to swallow in the notion that people's occupation, including the practice of *techne*, was determined by their nature. The straightforward metallic labels also belie the difficulty of detecting what the nature of an individual actually is. Partly, this will be done in the course of educating the young. Partly, however, it will depend on previous expectations. Socrates' insistence that children be reared communally, and their parentage not known, is inconsistent with his attention to regulated reproduction, and, most tellingly, with his remark that each group within the city train their children from an early age into their own activity: technicians teach their sons, while children of guardians and soldiers have to observe and experience their parents' *techne*.[69] But if children are not supposed to know who their parents are, how would that take place?

[66] Plato, *Republic* 473d–e, 494a–b, 518e–519b; cf. Xenophon, *Memorabilia* 4.1.2–4.

[67] Plato, *Republic* 414c–415a, 546e: a connection between this and Hesiod's myth; Vernant 1965c: 259; De Fidio 1971: 259–63; Adkins 1973: 7; Cambiano 1991: 151–3, 161, 166; S. Morris 1992: 49; Rose 1992: 355, 367–9; Loraux 1996: 46, 116–17; Ober 1998: 226, 315.

[68] Plato, *Republic* 382d, 389b–d, 459d; Loraux 1996: 116; Lloyd 2003: 145.

[69] Plato, *Republic* 421e, 466e–467a, 408c–e, cf. *Laws* 643b–d, 695a.

The useful lie is thus necessary to maintain the social order proposed in the dialogue. It has to make the fact of their subordination palatable to the subordinate group. If these latter were liable to be persuaded by philosophical arguments, then they would be guardians or at least soldiers, but since they are not, they are to be lied to for their own good. The lie also disguises the fact that ultimate decisions about assigning someone to one group or another, which are 'officially' based on nature, may ultimately be a matter of ready-formed assumptions, and thus not based on individual nature at all.

Plato may be playing tricks with us, his readers, as well – we know the story of the inborn natures is a lie, but is it a lie about metals and autochthony, or is it a lie about there being inborn natures at all? To look at it from a different angle, if virtue or political *techne* could be taught, if a technician could learn to be a guardian, there would no longer be a need for guardians as a distinct, privileged group; we would be indeed in the world of Protagoras' myth, according to which we are each good at only one *techne*, and perhaps were born that way, but politics is a *techne* for everybody, certainly not just for a few all-ruling guardians.[70] The point is, no *polis*, not even a simple 'city of pigs' can exist without technicians, but one can easily imagine a world without guardians, or simply verify that no such world exists in reality. Thus, the doubt may insinuate itself that technicians may after all be more indispensable, and thus more important, than guardians. Plato spends a significant amount of time neutralizing the fact that technicians are necessary, by showing that they in their turn cannot really do without guardians, and that the functions performed by the guardians are, if looked at philosophically, more necessary than those supplied by the technicians.[71]

The question of nature and education in Plato's *Republic* is linked to the concrete problem of how the Athenian youth should be educated, which is tackled in several of his other dialogues. Can virtue be taught? Is it acquired by practice, or does it come with nature?[72] In the *Meno* (which, famously, contains a demonstration that knowledge does not come exclusively from having learnt), the issue is rephrased as, is virtue an *episteme*? Because if virtue is a knowledge, there must be teachers of it. Anytus, the tannery owner, is chosen as mouthpiece for the opinion that virtue is transmitted through one's family; he had been introduced (ironically?) as the 'best

[70] Adkins 1973: 11–12. [71] Cf. Laks 1990: 219–20; Meyer 2004, with Brennan's objections.
[72] Plato, *Euthydemus* 305c–307c, *Meno* 70a, 86c–d; cf. Isocrates, *Against the Sophists* 21; Cambiano 1991; Jori 1995: 412–14; Roochnik 1996: 62–3; Euben 1997: 244.

qualified for the task'. Socrates then gets Anytus to admit that virtue is *not* teachable, because if it could be taught by the best teachers (i.e. older virtuous men), then all the sons of famous Athenians like Themistocles would have been virtuous, when in fact all their fathers could make them learn was various *technai*. The (ironic?) conclusion of the *Meno* is that virtue is neither natural nor taught, but comes from divine fate.[73]

Among the more or less contemporaries of Socrates and Plato, many sophists allegedly maintained that *techne* was teachable. In fact, conferring the status of *techne* onto politics or virtue basically amounted to a claim about their teachability. Protagoras, for instance, is said to have argued that virtue was teachable and that the Athenians considered it such, all while running a parallel with the teaching of *technai*.[74] The anonymous author of the *Dissoi Logoi* (c. 400 BC) listed arguments (most of them also found in Plato) in favour and against the notion that wisdom and virtue were teachable, concluding that, while himself not persuaded that wisdom and virtue *were* teachable, he found the counter-arguments also unsatisfactory. Indeed – he remarks – despite the existence of natural inclination, even the language we learn, without even realizing that we are learning it, depends entirely on our environment: a Greek child brought up in Persia will speak Persian.[75]

For Xenophon and Aristotle, good technicians (including doctors) are not born, but learn from a good teacher. Isocrates, starting from the fact that there are people who have become good orators without formal training, takes a more nuanced position. Those born with the right nature, he says, have a potential (*dynamis*). Formal training (*paideusis*) and experience make them more technical, but cannot give accomplishment to a nature that is not already apt to a certain task. Thus, only the combination of talent and learning will produce the real expert or 'champion', but virtually anybody will obtain at least some results with the right training.[76]

Turning to the technicians' side, the issue of teachability is not discussed at length in the Hippocratic Corpus, perhaps because the tenet that

[73] Plato, *Meno* 89c–90b, 91b, 93a–94e, 96d, 99e–100b, cf. *Gorgias* 520d9–11, *Protagoras* 319e–320b, also Xenophon, *Apology* 29–31. Anytus was one of Socrates' accusers at his trial. Blank 1985: 18–19; Cambiano 1991: 127–8, with further references.

[74] Plato, *Protagoras* 328c, no conclusion is reached in the dialogue as to whether virtue is teachable or not, cf. *Gorgias* 449b, d. I disagree with Euben 1997: 213–15.

[75] *Dissoi Logoi* 6, in Kent Sprague 1972.

[76] Xenophon, *Memorabilia* 4.2.2–7; Aristotle, *Nicomachean Ethics* 1103b7–14, *Politics* 1337a19–22 but cf. 1327b23–32; Isocrates, *Against the Sophists* 14–15, *Antidosis* 201–8. Note that Isocrates' context is polemical. Cf. Euripides, *Suppliant Women* 913–14; [Hippocrates], *Ancient Medicine* 5. See also Roochnik 1996: appendix 4.

medicine can be taught and must be learnt was taken as a given. Crucially, the doctor is said to learn from experience and not just from instruction such as is provided by teachers or through books. For instance, *Decorum* states: 'in the *techne*, as in knowledge, use is not taught'. The text insists on the importance of action over words, and on the fact that *techne* involves *both* experience or use *and* natural ability. A similar position in *On Techne*: the power of curing belongs 'to those whose education has not been dismissive, and whose nature is given to hard work'. Again a fine balancing act in *Law*:

> one needs, for someone who is to acquire a knowledge of medicine in a precise manner, that he becomes endowed with these things: nature, teaching, a suitable place, learning from childhood, love of hard work, time. Now first of all there must be nature, for if nature works in opposition everything is in vain. But when nature points the way to what is best, there is teaching of the *techne*. This must be acquired along with prudence by one who from a child has learnt in a place properly suitable for learning. Besides, he must apply love of hard work for a long time, in order that learning, having been implanted, may reap the fruits in good fortune and abundance.[77]

In other words, nature and nurture are presented as not in opposition, but as working together. Moreover, the concept of 'nurture', what is in addition to nature, expands to include not only one's one own experience, but also, thanks to textual transmission, the shared experience of other doctors across time and space. This is behind the idea, mentioned earlier, that accounts of mistakes should be passed on for people to learn from them: experience for the Hippocratic doctors was not a solitary journey.

The emphasis on the harmonious conjunction of a favourable predisposition and proper training could also be the result of the complex circumstances in which doctors operated. On the one hand, it is well-established knowledge that medicine at the time was taught through apprenticeship from a rather early age, and that therefore the pupil–teacher relation and the teaching situation this must have implied were hugely important. On the other hand, specialized training took place in a context where claims were advanced by the sophists that anybody could learn almost anything, and where the *technai* were not only teachable, but teachable for a fee. While medicine and other *technai* were often family traditions, the possibility could have presented itself that anybody, including slaves, could become a technician – a good or less good one, but a technician

[77] [Hippocrates], *Decorum* 4, *On Techne* 9.16–18 (I take ἀταλαίπωρα from Jouanna, rather than ταλαίπωρα from the Loeb edition), 11.1–11, *Law* 2.1–12.

nonetheless. In such a competitive climate, it could be that, in reminding the reader of the importance of natural talent (sometimes in the form of manual dexterity), the doctors were staking a claim to special expertise, as well as differentiating between good and bad practitioners.[78]

THE TROUBLE WITH *TECHNE*

Plato's sustained engagement with the problem of how to control technicians shows that, for many, *techne* spelt trouble.

One of the most frequently highlighted danger zones was its moral neutrality: *techne* produces, but does not necessarily provide, knowledge about how to use the product. Already according to the chorus in Sophocles' *Antigone*, *techne* could be used for both good and bad ends; like human beings, it could be both terrible and wondrous.[79] A similar ambiguity is detectable in Sophocles' *Oedipus Tyrannus*: the protagonist attributes to himself wealth, kingship and '*techne* surpassing *techne*'; he then characterizes Tiresias, the seer who has darkly alluded to the true story of Oedipus' family, as 'blind in his *techne*' – remember that divination was a *techne*. Finally, he describes his own achievement in solving the sphynx's riddle as intelligence (*gnome*), not something he had learnt. Oedipus' distinctive form of knowledge is therefore, despite his claims, no *techne* after all, and the technical incapacity he attributes to Tiresias (who is, of course, literally blind, just as Oedipus will be at the end of the play) ends up providing an accurate account of the facts, and a solution to the plague at Thebes.[80]

The problem of the moral ambiguity of *techne* is amply discussed in Plato: even the greatest possessions (gold, health, immortality) are pointless, he says, if one does not know how to use them properly. The *Euthydemus* launches an ultimately fruitless search for the *techne* which both produces and knows how to use what it has produced. Various candidates are mooted, but they are all revealed just to make things and then hand them over for other *technai* to use. Ultimately, Socrates shows that technical knowledge is inadequate to venture into moral and political territory, and that, rather than a super-*techne*, an altogether different form of knowledge is required.[81]

[78] Cambiano 1991: 49; 51–3.

[79] Sophocles, *Antigone* 365–7. Segal 1964: 152; Frontisi-Ducroux 1975: 64–8, 140; Gundert 1976; Rose 1992: 307, 340–1; Cordes 1994: 40–2; Roochnik 1996: 57–63; Euben 1997: 171–6, 248; Kosak 2004: 85.

[80] Sophocles, *Oedipus Tyrannus* 380–403.

[81] Plato, *Euthydemus* 289a–291d, *Protagoras* 316d–317a, *Statesman* 272e, 273c, e, 279b, *Timaeus* 89b–c. Cf. also Aristotle, *Nicomachean Ethics* 1105a26–b2. Cambiano 1991: 140–1; Kosak 2004: ch. 2.b; Roochnik 1996: 30–1.

As we have seen, questioning whether technicians know how best to use their own products amounts to denying them control of their own activities. This is reinforced by the claim that it is possible for the technician to do bad things precisely because he has an expertise that normal people do not have. Both Plato and Aristotle give currency to the notion that only the expert can voluntarily get things wrong. Thus, a doctor who knows what he is doing could kill you and make it look like natural death. The real expert is the best deceiver.[82] It would then take another, possibly better, expert to tell whether the death of a patient, for instance, or a miscalculation in accounting are 'real' mistakes or particularly crafty deceptions. The disturbing realization that only experts can judge (and therefore control) experts is found in several of our sources, and its political repercussions are often articulated.

As is well known, in Athens most offices were assigned by lot – no special qualifications or talents, other than citizenship, were required to play a part in the running of the state. For some technical matters, however, the assembly would consult doctors, shipbuilders and architects, thus acknowledging the existence of spheres of expertise. By the same token, one occasionally conceded authority to the otherwise disempowered (when it comes to weaving, men listen to women), and submitted to things which were normally avoided (patients comply when doctors prescribe purging or burning). For Plato it then becomes even more unsettling that, 'when [the assembly] have to deliberate about something connected with the administration of the city, he who stands up to advise them on these things may equally well be a builder, a smith, a shoe-maker, a trader, a sea captain, rich, poor, well born, not well born, and nobody thinks of rebuking him'.[83]

The passage exposes the political marrow of questions about expertise. Should the capacity to run the state be seen as a specialized form of knowledge – a *techne* – or not? The response of Protagoras' myth was yes, but also that the *techne* of politics was not limited to this or that group – it belonged to all as a matter of course. Plato, on the other hand, navigated an uneasy course between the various possibilities, and seemed to come to the conclusion that the capacity to run the state was a form of knowledge (call it philosophy or dialectic), and that within certain limits it could be taught, but it was not a *techne*. In fact, the notion itself of *techne*

[82] Plato, *Lesser Hippias* 365d–368a, reprised at 373c–375d, medicine at 375b, 376a, *Protagoras* 345a, *Republic* 333e–334a, 340e; Aristotle, *Nicomachean Ethics* 1140b22–3; Cambiano 1991: 75n. 55; Cordes 1994: 115; Kosak 2004: 77, 81.

[83] Plato, *Gorgias* 455a–456a, *Protagoras* 319d–e, 320b; Aristotle, *Nicomachean Ethics* 1164b22–5, *Politics* 1281b37–1282a24; Xenophon, *Memorabilia* 1.2.9, 3.9.11; *Dissoi Logoi* 7, in Kent Sprague 1972.

needed to be redefined. In the *Statesman*, the perfect ruler has a *techne*, but the dialogue is careful to establish that not everybody, in fact very few people, in fact perhaps only one person, can possess it.[84]

Plato employs numerous technical analogies for statesmanship: weaving, measuring and even shepherding, but most frequently medicine and the art of the pilot.[85] For instance, to a perfect ruler, as to a doctor, all that matters is the benefit to the body – or by extension the body politic – independently from wealth. Like a ruler, the doctor seeks not his own interest. A good ruler should not lay down laws that are too inflexible and not adaptable to individual circumstances, just like a good doctor may be forced to change his own rules, against the patient's wishes, for the good of the patient.[86] The parallels become more poignant when they are inscribed in scenarios that evoke the Athens of the time. In the *Statesman*, pilot and doctor are the supreme models of kingly rulers. But imagine, Socrates says, that nobody trusted doctors or pilots any more because of the sudden realization that they can do bad things if they want to, such as killing under the pretext of administering a drug or leaving a passenger on a deserted island. Consequently, the assembly would decide that doctors and pilots should have no unchecked authority, and that, every time a decision about sailing or disease is required, the assembly must meet and the majority decide, whether it is composed of doctors, pilots, or people with no knowledge at all. Clearly, the conclusion runs, this would destroy all *technai* for ever.[87]

The flip side of the coin of these positive political analogies are passages where technicians are assimilated with the greedy and the servile. For Aristotle, the *banausos* technician is even worse than a slave, with whom he shares the dependence on someone else: the slave at least has the advantage of a common life with the master; also, slavery exists by nature,

[84] Plato, *Statesman* 300e–301a. Wood and Wood 1978: 174: this is a direct response to the myth of Protagoras in the *Protagoras*; Balansard 2001: 284–91. I also see Plato, *Statesman* 306b–c as an allusion to the description in the *Protagoras* of virtues as features in a face. Again, Plato's *Protagoras* 356d–357b could be a parody of Protagoras' famous statement that man is the measure of all things. Cf. Wood and Wood 1978: 136n. 17; Roochnik 1996: 212–27; Euben 1997: 256–62.

[85] Plato, *Statesman* 305e–306a; cf. Aristotle, *Nicomachean Ethics* 1181b15. Weaving is a feminine *techne*, which makes the use of it as an analogy for politics particularly intriguing, cf. Vidal-Naquet 1981: 227; Loraux 1984: 175. See also in general Balansard 2001: 228–33.

[86] Plato, *Gorgias* 519a. The dialogue ends (521d–522a) with Socrates taking up the mantle of the true technician – a doctor, cf. *Laws* 660a, 684c, 735d–e; *Republic* 342d, 360e–361a, 564c, 567c, 902d–906a, 961e–962b, 965b; *Statesman* 293a–297a, 302a. The ship of the state is a common image in tragedy: Sophocles, *Antigone* 184–90, *Oedypus Tyrannus* 22–6, 168–70. See De Fidio 1971; Detienne and Vernant 1974: 148–62, 223–6; Ober 1998: 210–11.

[87] Plato, *Statesman* 297e–299e, *Republic* 488a–489a, 489b, cf. 551c.

shoe-makers and other technicians do not. It is therefore not surprising that in Aristotle's view, the *banausoi*, although they, just like slaves, may be indispensable to the *polis*, should not be citizens. In an aristocracy (Aristotle's constitution of choice), they would not have the leisure time to engage in the honourable pursuits that make someone worthy of ruling. Nevertheless, in an oligarchy, ruled by the few but not necessarily by the best, a *banausos* can be a citizen, 'for many of the technicians are rich'. As for extreme democracy, Aristotle identifies it more markedly than other constitutions as a decline from the old days, when the *banausoi* did not participate in government because they were slaves or foreigners. An extreme democracy is a state where the lowly technicians rule.[88]

We have already discussed Plato's anxiety about the political presence of technicians. It can be further and more explicitly exemplified by passages such as this:

> just as men escape from prisons to temples, so these gladly leap up from the *technai* to philosophy, those who happen to be most clever in their little *techne*. For compared with the other *technai* the reputation of philosophy even practised in such a way remains more magnificent; to which aspire the many with imperfect natures, whose bodies are as much mutilated by the *technai* and demiurgic activities as their souls happen to be broken and crushed by banausic activities.

Apart from the recurring theme of the association of physical and spiritual deformity, and of both with technical activities, note also the identification of technicians with dangerous social climbing.[89] An even more radical solution to the problem of technicians than the 'useful lie' of the *Republic*, with its dream of regulating activities and curbing mobility, is again in Plato's *Laws*. In the city described there, some technical jobs are part of the magistrates' duties, but otherwise the citizens have 'handed all the *technai* over to others' – all technicians are now foreigners.

> No one shall be a resident citizen of those who devote themselves to demiurgic *technai* [. . .] a citizen possesses enough of a *techne*, requiring much practice, and at the same time much learning, to save and hold the common universe of the *polis*, which he must not pursue as a secondary business [. . .]. This law the city lawgivers shall work hard to save, and they shall punish with reproaches and dishonour the

[88] Aristotle, *Politics* 1260a37–1260b3, 1264b14–16: perhaps an objection to Plato's *Republic*'s notion of natural-born technicians, 1268a20–1, 1277a37–1277b3, 1277b32–1278a25, quote 1278a24–5, 1291a1–4, 1317a23–5, 1318b10–12, 1319a20–1, 1319a24–31, 1329a20–2; cf. Plato, *Protagoras* 347c–d; Xenophon, *Memorabilia* 3.7.6, 4.2.22; Cicero, *On Magistracies* 1.150–1. Nightingale 1995: 58 and 1996: 32; Ober 1998: 303n. 31, 306–8, 314–16, 340–1; Morawetz 2000: 22–33.

[89] Plato, *Republic* 495d–e, 496a, *Laws* 644a (quotation), *Phaedrus* 248c–e; *Statesman* 289c–291c.

resident citizen, if he inclines towards some *techne* rather than to the pursuit of virtue, until they guide him to his course.

As in the *Republic*, each person can practise only one *techne*, and not on a large scale; technicians are to be settled in the city and in the countryside, in numbers and types according to need, and are to be strictly supervised 'so as to be of least trouble'. Foreigners with a *techne* can stay in the *polis* for up to twenty years, at the end of which they have to leave, taking their property with them (obviously they are forbidden from owning land). If they have been of special service to the state, they can apply for life-long residency. As for their children, who will have been trained in the same *techne*, they can start counting their residency from the age of fifteen.[90] The spatial arrangement of the *Laws*, with technicians marginalized and scattered, finds an interesting parallel with the Athens of old described in *Critias*, where the priests and soldiers live on an acropolis that extends over the Pnyx (the actual Athens' assembly space), and is fenced off from the outer areas, under the slopes, where farmers and technicians live.[91]

Almost in response to the allegations that *techne* is at best morally neutral, at worst marked by a dangerous propensity to upset the prescribed social order, the Hippocratic treatises abound in statements about the virtues of the doctor, often in the context of drawing boundaries between good and bad practitioners, and of constituting the identity of the discipline.[92] In contrast to the menace of the 'expert mistake' we found in Plato, knowing what harms is presented as indeed part of the *techne* of medicine, and learning about it as part of training, but to make a *techne* of something bad – administering poison rather than, say, prescribing the right regimen – is strongly characterized as non-*techne* (*atechnie*).[93] Many treatises deal with the necessity for doctors to be virtuous and not greedy for money: humility is emphasized as a virtue, and service to the patient insisted upon. *Epidemics* 6 lists various ways of being kind to those who are ill, including softness of touch, cleanliness and taking care of one's clothing and hair. 'The *techne* consists of three things: the disease, the patient, the doctor. The doctor is the servant of the *techne*.' Living in the service of medicine is not

[90] Plato, *Laws* 763c–d, 778c–779d, 806d (first quotation), 846d–847a (second quotation), 848a, 848e (third quotation), 850b–c, 915b, 919a–920a, 949c. Cf. Whitehead 1977: 129–36.

[91] Plato, *Critias* 112a–b. On spatial arrangements in the *Laws* see Vidal-Naquet 1981; *contra* Saunders 1982.

[92] Lloyd 1991: 249.

[93] [Hippocrates], *On Techne* 1.1–2, 8–9, 14; 5.22–30, 8.32–41, *Fractures* 1, *Ancient Medicine* 9. But cf. *Regimen* 1.24: the list of *technai* which have something in common with the nature of man in *Regimen* 1 includes deceptive and paradoxical aspects.

easy: the doctor has to touch unpleasant things, see terrible sights, and be exposed to the misfortunes of others.[94] Also, doctors should collaborate with each other for the sake of the patient. According to *Precepts*, one of the characteristics of a bad doctor – apart from not following the right methods – is the fact that he avoids a good doctor, instead of considering him a fellow technician (*homotechnos*). The good doctor should never hesitate to consult others if necessary, without quarrelling.[95]

Crucially, some treatises contain warnings about what is disgraceful or shameful (*aischron*), indicating that moral conduct and reputation were indispensable components of good medical practice. For instance, *On Joints* adds to an explanation of how to fix humps: 'it is shameful in any *techne*, and not least in medicine, to exhibit a big fuss, a big spectacle, and a big mouth, and then be of no help'. And later on: 'first, it is necessary [. . .] to do so as to make the patient healthy; and if he can be made healthy in many ways, one needs to choose the least troublesome. This is more honourable and more technical for anyone who does not desire the adulterated coin of the crowd'.[96]

We know that for many doctors competition, rather than collaboration, was the order of the day, and that this implied a public persona, with rhetorical skills and oral performances. Displays of persuasive speech, about the status of medicine among other topics, were one of the ways that doctors had of differentiating themselves from temple healers or rootcutters.[97] It might also be that public physicians had to hold their own in front of the public assembly that would elect them.[98] From the point of view of the doctors, then, ethical issues would have been again a way of distinguishing between good and bad practitioners, or (at least from what is hinted in *On Techne*) between medicine and other *technai*, particularly rhetoric. Crucially, far from ambivalence, the *techne* of medicine was presented as morally positively charged, with a self-image of humility and sobriety to counter what may have been blanket accusations of greed and arrogance – the image of the mutilated bodies of the *banausoi* set against the dignified demeanour of the doctor.

[94] [Hippocrates], *On Techne* 11.27–30, *Decorum* 5, *On Breaths* 1, *Epidemics* 1.11 (quotation), 6.4.7, *Law* 5.1–3; cf. Lloyd 2003: 52. The passage in *On Breaths* plays a big role in Kosak 2004: 38–41 and ch. 2.a.

[95] [Hippocrates], *On the Doctor* 1, *Precepts* 6–8. Kosak 2004: 44n. 3. *Homotechnos* at Plato, *Charmides* 171c to refer to a technician being able to assess another technician.

[96] [Hippocrates], *On Joints* 44, 78, cf. 42, *Precepts* 9. See Jori 1996: 33–9; Laskaris 2002: 73–5 with references.

[97] Lloyd 1987; Jouanna 1992: 82–6.

[98] Lloyd 1987; Jouanna 1992: 78–80.

CONCLUSION

Our quest for a definition of *techne* in classical Greece has not produced a unified result. There was enough consensus on the characteristics of a *techne* that it was possible definitely to identify some disciplines as *technai*, but on the other hand there was also enough disagreement to make us suspect that apparently innocent discussions about the characteristics of different forms of knowledge must have also been about something else.

To some extent, the existence of significant divergence could be simply a matter of competition between disciplines. For instance, Plato's approach to technical knowledge partly reflected his concern that a very popular *techne*, rhetoric, might eclipse his own brand of philosophy as the privileged form of political knowledge.[99] Equally, one could point to the polemical tone of *Ancient Medicine*, and read much of the material we have gone through in terms of medicine's and natural philosophy's both staking claims to privileged knowledge about the nature of man:

> I believe that some clear knowledge about nature comes from nothing other than medicine; one can acquire this knowledge when medicine itself has been rightly comprehended, but until then it seems to me we are far from it – I mean to obtain an accurate account of what the human being is, through what causes it comes to be, and similar things.[100]

And for each doctor taking a walk on the turf of the natural philosopher, there is a Plato expounding medical theories in the *Timaeus* and presenting his doctrine as essentially a form of therapy for the soul, while at the same time arguing that the soul is more important than the body. Or take Gorgias: as well as allegedly proving more persuasive with patients than his doctor brother, in *Encomium of Helen* he compares words to drugs.[101] Rhetoric and medicine may have constituted a further agonistic front, especially if the recorded attacks against medicine and other *technai* came from rhetors or sophists. The author of *On Techne* retaliated against accusations that medicine was no *techne* by showing not only that it was, but that rhetoric was in fact no *techne* at all.[102]

[99] Blank 1985: 14–15.

[100] [Hippocrates], *Ancient Medicine* 20, cf. also *Fleshes* 1–2, *Nature of Man* 1, *Precepts* 1–2. Aristotle, *On Respiration* 480b22–31, *On Sense and Sensible Objects* 436a17–b1. Lloyd 1963 and 1991: 252–3; Di Benedetto 1986: 214–15; Cambiano 1991: 20–2, 31–3, 42; Jouanna 1992: 282–5; Jori 1996: xix, ch. 7; Schiefsky 2005: 36–62.

[101] Plato, *Timaeus* 82a–89c; cf. also the discussion in the *Charmides*. I see Plato, *Laws* 720a–d, on the contrast between freeborn and slavish doctors, in this light, cf. 857d. See also Anton 1980; Kudlien 1985; Cordes 1994: 48; Roochnik 1996: 71–4; Craik 2001.

[102] Heinimann 1961; Jori 1996: chs. 13–14.

Competition between different forms of knowledge, or within the same form of knowledge, was a very important factor underlying the various definitions of *techne* that circulated in classical Athens, and can help explain some of the divergences we have observed. But one has to ask, competition for what? I am suggesting that, as well as purely epistemological interests, and more practical ones (doctors competing for patients, rhetors for pupils), the issue was, what social and political order, what configuration of power did different forms of knowledge stand for? To support or denigrate a certain form of knowledge was also to uphold or criticize a certain view of the *polis* – as I put it earlier, borrowing Josh Ober's words, 'that "all knowledge is political" (i.e. implicated in relations of power) was simply a truism' in classical Athens. To put it differently, statements about *techne* were also statements about technicians, and statements about technicians were also statements about the values or potentialities or threats which the technicians represented, or were thought to represent.

Concretely, Athens in the late fifth to fourth century BC saw the rise of a new breed of political men, who did not belong to the small group of families, often interrelated through marriage arrangements, which appear to have been more prominent until then. Aristophanes often depicts these people as technicians: Cleon 'the tanner' is perhaps the most (in)famous of all.[103] In Plato's *Apology* Socrates examines the claims to knowledge of various groups, and finds that the technicians (called both *cheirotechnai* and *demiourgoi*), unlike poets and rhetors, knew things that he did not. Yet, knowing their *techne* well had led to them to think that they were wise in other, more important, domains, and this was a trespass/a false note (*plemmeleia*). In other words, technicians were the group Socrates chose to monitor more closely, because their knowledge was better substantiated than that of their counterparts, and that made them more liable to getting ideas above their station. At Socrates' trial, his three accusers stood for three groups and three forms of knowledge: poets, rhetors and *demiourgoi* – those latter represented by Anytus.[104] He was an actual example of social mobility: the owner of a tannery, his father had moved from *thetes* (hired labourer, the lowest class) to *hippeis* ('knight', two classes up). In the *Meno*, Anytus ominously warns Socrates of his impending fate. The *Republic* itself is framed by the encounter with Cephalus, a wealthy metic who profited from trade and manufacture.[105]

[103] Connor 1971: *passim*, 152; Mossé 1995.
[104] Plato, *Apology* 21d–22e, 23e–24a. On Anytus, see Mossé 1995: 71; Balansard 2001: 174–5.
[105] Plato, *Republic* 330c; Annas 1982: 18–21.

Thus, it seems obvious that distaste for the banausic technician channelled wider disquiet about non-traditional power groups, and not just in Plato. Demosthenes' speech against Eubulides discusses poverty and citizenship. The accuser uses the fact that his opponent's family sold ribbons in the marketplace and that his mother was hired out as a wet-nurse to claim that he is no citizen. The response is that at Athens poverty does not exclude a person from citizenship, nor do trade or engaging in paid work. But the point needs to be made, even in the strictly polemical context of the court – the speaker refers to recent social upheaval whereby people who used to be rich have fallen upon hard times, and people who used to be poor are now rich.[106] Another court case, taken up by Lysias, involved a citizen who was applying for a state pension on the basis of being an invalid, and had to defend himself against the charge of knowing a *techne* and being able to get a livelihood out of it. Interestingly – again in a polemical context – practising a *techne* is linked to affluence and to the opportunity of associating with the wealthy.[107]

Technicians were associated with unregulated mobility and change. More than that: technicians were associated with resilience, the capacity successfully to survive, indeed thrive on, change. The anecdote circulated in antiquity of the craftsman surviving a shipwreck with his knowledge intact, while his fellow passengers had to throw their riches overboard and ended up destitute.[108] Every *techne* precipitates a dramatic change: it produces something – a shoe, a house – that did not exist before; it makes someone who was ill healthy again. Above all, *techne*, as something that can be taught, changes people – it transforms laymen into experts. Practically anybody can learn rhetoric: some will do better and some worse, but they will all become rhetors of sorts. Mirroring the myth where Prometheus, the father of all *technai*, creates the new race of humans, *techne* produces mutants, people born as one thing and transmogrified into another.[109]

Now, an aristocratic *ethos* was widespread in classical Greece, according to which you were entitled to a share in power, wealth, culture by virtue of being born in a certain family, having some innate virtues or dispositions, and cultivating your character in a way that relied on those innate virtues

[106] Demosthenes, *Against Eubulides* 30–45.

[107] Lysias (c. 459–380 BC), *Orations* 24. 4–5, 9, 19–20, cf. Isocrates, *Areopagiticus* 15.

[108] Vitruvius, *On Architecture* 6, preface; Galen, *An Exhortation to Study the Arts* 8–9; S. Morris 1992. See Burford 1972: 82; Bettalli 1985; Fischer-Hansen 2000.

[109] Connor 1971: 158–63; Detienne and Vernant 1974: 108; Whitehead 1977: 19; Rose 1992: 25–6; Jori 1996: 118–25; Euben 1997: 80–1, cf. also 111.

and dispositions.[110] We find this well expressed in (again) Pindar: 'one with inborn glory carries great weight, but he who has mere learning is a shadowy man; ever changing his purpose, he never takes a precise step, but attempts innumerable feats with an ineffectual mind'.[111] Technical knowledge, however, concretely demonstrated the possibility that one's entitlements were not necessarily determined by what one was born with, but may have derived from learning something. And, more than virtue or courage, this could be assessed on the basis of results: are you persuaded by my speech, does the ship hold water, is the sick man healed? Crucially, with *techne* one learnt how to do something useful, even necessary, for the city. This characteristic is in evidence throughout our discussion: without *technai* and consequently without technicians, there would be no human civilization as such. Technicians were necessary: the *banausos* may be despised but he is needed; perhaps he is despised *because* he is needed, and need is, ultimately, a form of weakness.[112] This point is then key: the main characteristics associated with *techne* and technicians – the ability to precipitate change and the ability to produce the useful and necessary – were by some perceived as dangerous and threatening to what we could call an aristocratic social order.

For all the modern historians' insistence on the marginality of ancient technicians, the sense of menace coursing through some of our sources suggests otherwise. And for all of Plato's and Aristotle's dreams of a *banausos*-free ideal state, even from the point of view of mythology Athens was a technician's city. According to a well-known story, the parents of the first Athenian, Athena and Hephaestus, were both technicians.[113]

More than the blue-eyed goddess, the lame smith Hephaestus offers some interesting insights. To get back to the play we began with, and whose political resonance is obvious (if widely debated), in Aeschylus' text Hephaestus and Prometheus curiously bond. Hephaestus, who has been

[110] Plato, *Menexenus* 238c–d (ironically?); Loraux 1981: 152; Ober 1989: 291; Cordes 1994: 25–31.

[111] Pindar, *Nemean Odes* 3.40–3, Loeb translation. Asclepius mentioned at 53–4; poets as builders (*tektones*) at 4. The ode dates to the first half of the fifth century. Cf. also *Pythian Odes* 3.113, *Nemean Odes* 4.1–5, 5.40–3.

[112] [Aeschylus], *Prometheus Bound*; Sophocles, *Antigone* 332–75; Aristotle, *Politics* 1328b6–15; Plato, *Laws* 677b–679d, *Timaeus* 23a. Connor 1971: 122–7; Burford 1972: 185–6; Detienne and Vernant 1978 [1974]: 13–14, ch. 4; Frontisi-Ducroux 1975: 181–2, 188; Whitehead 1977: 70, 133; Petre 1979.

[113] Aeschylus, *Eumenides* 13: Athenians called 'children of Hephaestus'; Plato, *Laws* 920d–921a, cf. Xenophon, *Memorabilia* 1.2.37, 2.1.28, 32. See also Vidal-Naquet 1981: 232–4. Burford 1972: 166–7; Detienne and Vernant 1974: 140–1; Loraux 1984: 125–7; Johnstone 1994. Athena's familiarity with technicians is depicted on some red-figure vases from the first half of the fifth century BC, where she appears in workshops or herself at work: Beazley 1963: 1 92 no. 64, 571, no. 73; Ziomecki 1975: 135–6; S. Morris 1992: figs. 59–61.

ordered by Zeus to forge the chains for Prometheus, is reluctant to do so.[114] In his dialogue with *Kratos* (*Bia* is also supposed to be present, but they could be one character with a hendyadic name) he refers to his companionship with Prometheus, calls the Titan a relative (*sungenes*), and blames his own (morally ambivalent!) manual skill, presumably because it now falls to him to use it to bind Prometheus. Hephaestus is depicted as definitely subordinated to *Kratos*, not just to Zeus, but Zeus's power is itself not absolute. It is clear that the god is newly instated, and throughout the play it is intimated that he may fall again.[115] Prometheus and Hephaestus are united by their maimed, suffering bodies – echoing the technician's body as depicted in some ancient sources. They also both resonate with what I have suggested were the threatening aspects of technical knowledge. Prometheus is an icon of change: through his gift of fire to humanity, he precipitates a very dramatic mutation, a passage from sub-human to fully human condition. In fact, he himself will experience dramatic upward mobility, ending up free and perhaps 'one day treated as an equal by Zeus'. At the same time, Prometheus is *necessary* to Zeus: before he steals fire, he helps him gain his throne, and afterwards he is the only one who knows how to save the supreme god from impending doom. So, while subordinated and subjugated, Prometheus is indispensable.[116]

Similarly, in another myth, Hephaestus, having been thrown out of Olympus by his mother Hera, retaliates by learning a craft and then producing a throne for the goddess, which traps her as soon as she sits down on it. The gods now *need* Hephaestus back into their midst because he is the only one who knows how to solve the situation and release Hera. The result is that he returns triumphantly to Olympus and has his status not only secured, but enhanced, by marrying Aphrodite.[117]

Centuries later, we find awareness of these same issues in Galen. In a work where he opposes personifications of *techne* and *tyche*, he points out that technical knowledge can bring about changes in the customary social hierarchies, as it had arguably been the case for him. *Techne* can compensate for the lack of noble birth by producing honour via alternative routes, and Galen produces examples of people of lowly birth or even barbarians who were

[114] Plato's Protagoras' myth of Prometheus (*Protagoras* 321c–e) must be alluding to Aeschylus. Cf. also Plato, *Critias* 109c, *Statesman* 274c; Xenophon, *Memorabilia* 4.3.7; Euripides, *Suppliant Women* 195–218.

[115] [Aeschylus], *Prometheus Bound* 14, 39, 45, 35, 148–51, 312, respectively; Burford 1972: 189; Brommer 1978: 130.

[116] Detienne and Vernant 1974: 60, 82.

[117] Detienne and Vernant 1974: ch. 9; Brommer 1978: 10–11: the myth is depicted on more than 150 vases from the sixth and fifth centuries BC. Cf. also Homer, *Odyssey* 8.266–366.

admired for their wisdom and expertise. One of the social paradoxes associated with the *technai* is that, he says, people train dogs and horses, prize skilled over unskilled slaves, and want their land and other possessions to achieve their full potential, but take no care of their own education, learning no skills, and then falling prey to *tyche* if their money runs out. In other words, technicians are both necessary and resilient, whereas

> those who set great store by their noble birth [. . .] fail to understand that this nobility on which they pride themselves is like the coinage of a particular state; to everyone else it is counterfeit. [. . .] The virtues of our fathers are, as Plato says, a fine treasure; but how much finer to be able to reply, with Sthenelus: Greater by far than our fathers it is our boast to be.[118]

In conclusion, the answer to the question 'What is *techne*?', even limited to classical Greece, especially Athens, to a specific period and to the case of medicine, ought probably to be 'It depends on whom you ask.' There was more than one vantage point on the question of *techne*, and there was competition: within individual *technai*, in order to distinguish good and bad practitioners; in the epistemic arena, for what form of knowledge could subsume and dominate the others. There were attempts on several sides to appropriate and control competing forms of knowledge (and what better form of appropriation than definition?). These attempts mirrored the fact that in the political arena there was competition for whose voice should be heard and what the best form of government was. Thus, in order fully to understand both epistemological and political debates in classical Greece, we must recognize their interconnectedness. In the political arena, *techne* provided both a direct and an indirect referent. Directly, there were technicians in the assembly, there were technicians in the city, there were technicians in the army and especially the navy – technicians were present at the trials of philosophers and could help to bring them down; technicians could save your life, attempt an explanation of why their cure worked, and present themselves as models of virtue. Indirectly, the tensions inherent in the debate about *techne* were inscribed in myths, from the more recent parables put in Protagoras' mouth by Plato to the archetypal stories of Prometheus and Hephaestus. Like these figures, *techne* and technicians were symbols of change and mobility, of forces which, like the fire associated with both, were difficult to control and subordinate, but also, inescapably, necessary for the survival of human civilization.

[118] Galen, *An Exhortation to Study the Arts* 9–14, quotation 11–12, tr. Singer. The quotation within the quotation is Homer, *Iliad* 4.405; Galen lived in the first half of the second century AD.

CHAPTER 2

The Hellenistic military revolution

Plutarch reports a brief but significant episode, alleged to have taken place around 367 BC: 'Archidamus, the son of Agesilaus, on seeing a catapult projectile then for the first time brought over from Sicily, cried out "By Herakles, it is the end of manly virtue".'[1] As I see it, the key theme of this vignette is change: the beginning of something – catapults imported into mainland Greece – and the end of something else – the traditional way of fighting of which the Spartans were the most celebrated representatives.

Many modern historians will agree that the introduction of the catapult and the further changes it precipitated in siege techniques, fortification design and military expenditure, are a major part or even the main component of a 'military revolution' that marks the Hellenistic way of doing war as opposed to that of the classical period, and is also characterized by the advent of the specialized *strategos* and the mercenary over the citizen-soldier-hoplite and the politician-general of the Persian Wars. Not all historians are in agreement on the extent of the Hellenistic military revolution, or on when exactly it took place. The first issue depends on, for instance, the pervasiveness of hoplite fighting or the marginality of mercenary soldiers in the classical period; as for the second, many see the Peloponnesian War as a turning point, but for others the battle of Potidaea and the ascent of Philip II of Macedonia are key moments.[2]

Now, the Hellenistic way of doing war can be seen as a *technological* revolution, where the introduction of new weapons is only part of the story: 'warfare became more and more technical. How far was it then possible to satisfy the technical requirements without abandoning the conception of the practice of arms as a social function, without

[1] Plutarch, *Sayings of Kings and Commanders* 191e, Loeb translation, also in *Sayings of Spartans* 219a.

[2] Plutarch, *Life of Philopoimen* 3.1; Garlan 1974: 84 and 1975: 91–3; Ober 1987: 569 and 1991; Vela Tejada 1991: 48–9; Hunt 1998: 13; Ducrey 2000: 198; Ma 2000; van Wees 2004: 42, 71, 74, 197, 233, 240; Chaniotis 2005 20–3, 79.

"depoliticising" the military [. . .]? This is the fundamental question posed by the exercise of command at the upper level of the military hierarchy'.[3]

This is the double nature of the change encapsulated by the episode of Archidamus and the catapult. Within the alleged military revolution, two, presumably related, sub-revolutions might have taken place: one in the technology available, from catapults to fortifications, from open-field combat to long sieges – a revolution in the concrete way of doing war – and one in the attitude to doing war, particularly in what was required of a military leader.[4]

In this chapter, I will analyse, and eventually problematize, both sub-revolutions and their relation. My aim is to address the more general question, 'What was the nature of technological innovation in antiquity?' by means of the example of Hellenistic military technology – not just the construction of catapults, but also poliorketics (the *techne* of sieges) and strategy (the *techne* of the general).

We are encouraged by some modern historians to see Hellenistic military engineering as *the* exception to the stagnation or *blocage* of technology in antiquity (see the introduction).[5] Thus, a linear model of innovation and progress has generally been adopted to explain the technological revolution: briefly put, the catapult was invented at some point in time, and improved upon in a cumulative way, so that later catapults were better, i.e. more efficient, than earlier ones. In my view, the linear model glosses over the complexities of the textual and archaeological evidence. I will show, firstly, that notions such as innovation or invention, either in the ancient or the modern sources, tend to be constructions imbued by current values, rather than an objective description of how things really went. Secondly, that the often used notion of progress assumes a universal view of what is better or more efficient, which simply does not reflect the diversity of functions, tasks or users which technology is supposed to satisfy, either now or in the fourth century BC. I will come to the conclusion that catapults can be better explained by what I call a 'scatter' model, where technologies that may appear incompatible co-exist unproblematically. Crucially, this is a model to describe technologies in use, rather than innovation or invention.[6] As I will argue below, I do not think we are in a position to make strong claims about invention or innovation as far as the catapult is concerned, if only because the nature of the evidence does not allow us

[3] Garlan 1975: 145. [4] Garlan 1974: 3–7, 275–7; Bettalli 1990: 43; Chaniotis 2005: 31.
[5] A view endorsed by e.g. Garlan 1974: 224, 273–4 and 1975: 185.
[6] For a definition of technology in use, see Edgerton 1999.

to do so. Better, along with an increasing number of historians of technology today, I am convinced that the study of technologies in use is more rewarding, and provides more insights, than innovation and progress stories charting the genealogy of a particular stroke of human genius.

As for the second sub-revolution – the one in the attitude to doing war, I will take Beston's words as representative of many current views: 'ancient military history was in large part didactic, and [. . .] the lessons are about morals as much as tactics. Time and again moral qualities are stressed as a cause of victory or defeat in battle [. . .]. For ancient writers, the moral qualities of combatants *were* the real explanation'.[7] To that, I will suggest that, rather than an end of manly virtue, the Hellenistic way of doing war saw a redefinition of the traditional moral qualities of combatants, with great emphasis set on the importance of experience and of acquired knowledge, and culminating in iconic figures of technician-warriors, such as Demetrius Poliorketes (the Besieger) or, in Polybius' work, the Romans.

THE TECHNICAL REVOLUTION: INVENTION

399 BC or thereabouts, Syracuse. The local tyrant, Dionysius, has much to worry about: the foundations of his power are shaky, and he is in continuous danger of being overthrown by his own citizens, and/or by other Sicilians. At the same time, he has the Carthaginians on his doorstep. As you do if you are an ancient Greek despot and you feel insecure, Dionysius decides to renovate the city's fortifications. He summons architects, gathers a workforce, divides it into teams supervised by the architects, and encourages speedy completion by giving rewards to architects, but also to builders (*oikodomoi*) and simple workers. By way of incentive, he even joins in the works. Described by Diodorus as a sort of humiliation, this move proves effective: the wall is completed in twenty days.[8]

Dionysius' next step is to prepare for a new war with the Carthaginians. Again he gathers able *technitai* from Italy, Greece and the Carthaginian territories themselves, promising high salaries and rewards. 'For his purpose was to construct weapons in great numbers and all sorts of missiles, as well as four-type and five-type ships, no five-type hull having been built at that time.'[9] The technicians are again divided into teams according to their

[7] Beston 2000: 315.

[8] Diodorus 14.18.2–8, cf. 14.85.2–3, 17.115.1. Cf. also Arrian (second century AD), *Anabasis* 2.18.4.

[9] Diodorus 14.41.2–43.4, quote 41.3, Loeb translation with modifications. I have translated βέλη sometimes with 'artillery', sometimes with 'missiles' and sometimes with 'catapults', in an attempt

activities, and supervised by noble Syracusans; *philotimia* (love of honour or competition) ensues, the most distinguished homes being as full of activity as the workshops. Indeed, the tyrant himself spends time with the workers and directly encourages them.

> In fact the catapult was discovered at this moment (*kairos*) in Syracuse, since the best technicians had been gathered from everywhere into one place [. . .] the technicians, bringing unsurpassable love of honour, devised a great number of missiles and machines that were strange (*xena*) and capable of being of great use.[10]

There is much to this story, but for now let me focus on the element that seems to have attracted the most attention: Diodorus' claim that the catapult was a new thing.[11] Exactly what type of catapult are we talking about? Linguistically, the term *katapeltikon* in Diodorus' passage is straightforward enough, but it could be taken to refer to a belly-bow (a sort of large bow resting on the stomach of the person operating it), a non-torsion catapult or a torsion catapult. The difference between torsion and non-torsion catapults is the presence, in the torsion type, of two tightly twisted springs made of hair or sinew. Again, some catapults shoot arrows (arrow-shooters), some throw stones (stone-throwers). By and large, given that torsion catapults allowed for greater power and size than non-torsion ones, arrow-shooters are non-torsion and stone-throwers torsion engines. More often than *katapeltikon*, however, Diodorus (and other historians, from Thucydides to Polybius) employs more ambiguous terms, such as *bele*, which can be both 'missiles' and 'catapults', 'machines' (*mechanemata*/*mechanai*), or 'instruments' (*organa*), which in the context of siege equipment could be anything from a ram to a torsion catapult.[12]

Independently of the question of what type of weapon we are talking about, is Diodorus' story true? The answer is not easy. For a start, not all textual sources are in agreement about the origin of siege weapons such as

to reproduce the ambiguity of the term, which denoted both 'machine that throws things' and 'thing that is thrown by machine'. Notice that by 351 BC Sidon had five-type ships (quinqueremes) as well: Diodorus 16.44.6. Cf. also van Wees 2004: 206–9.

[10] Diodorus 14.42.1–2, Loeb translation with modifications. Cf. also 14.43.3; Philo of Byzantium, *Construction of Catapults* 56.14.

[11] Cross-references at Diodorus 2.27.1: in the seventh century BC, at the siege of Ninus in Mesopotamia, the besiegers were stalled for years 'for neither stone-throwers, nor shelters for sappers, nor battering-rams devised to overthrow walls had as yet been discovered at that time'. (Loeb translation with modifications), 14.50.4: at the siege of Motya in 397 BC 'these missile-throwing weapons [arrow-shooters] created great consternation, because they were first discovered at that moment (*kairos*)'.

[12] E.g. Diodorus 16.40.6, 16.41.4, 16.44.5, 16.67.2, 20.45.5; Maier 1959: 25 = *IG* II^2 1281. Vitruvius 10. preface 3 has a distinction between *machina* and *organum*, but there is no sufficient reason to think the distinction was adopted by other historians or technical writers. Pritchett 1991: 65–7.

the catapult and the ram.[13] Moreover, Diodorus has a parallel account of invention for the five-type ship (quinquereme), but a plausible Carthaginian line of transmission can be suggested for at least the quadrireme.[14] Again according to Diodorus, at the siege of Samos in 440 Pericles built 'the so-called rams and tortoises, the first to do so, with Artemon of Clazomenae building [them]', and Archimedes devised the water-lifting screw. Yet, there is hardly any dispute that rams were used in Assyrian, and presumably Persian, sieges, including of Greek towns, and it is at least possible that the water-lifting screw was already being used in Mesopotamia in the seventh century BC.[15] Why should we take the catapult story as more indisputable than the others? Yet more doubts are cast by archaeological evidence pointing to the possibility that siege weapons including the catapult (but again, it is not clear *what* catapult) came to Carthage from Mesopotamia via the Phoenicians.

A ninth-century BC relief from the Assyrian palace of Assur-nasir-apli II at Nimrud (Iraq) might depict a catapult, and stone balls that could be catapult projectiles have been found at Paphos and Phocaea, both sites of pre-Hellenistic Persian sieges.[16] Granted, the mysterious object in the Nimrud relief could be a ram – well attested in Assyria, along with siege towers and ramps – and the stone balls in Paphos and Phokaia could have been dropped, rather than thrown, by the besieged.[17] Plus, if catapults were known by at least the time of the Persian Wars, why do we never find them mentioned by historians before a certain point in time?[18] But, by the same token, is it not also strange that only Diodorus (mid to late first century BC) preserves the story of the discovery of the catapult in Syracuse? That neither

[13] Pliny the Elder 7.56 (201); Athenaeus Mechanicus 9–10; Vitruvius 10.13.1–3.

[14] Compare Pliny the Elder 7.56 (207) with Diodorus 14.42.2–3; Casson 1995: ch. 6; Janni 1996: ch. 9; Morrison 1996: 1–2.

[15] Diodorus 12.28.3 (ram) and 1.34.2, 5.37.4 (screw). The text could mean that Artemon was the first to build these things in, say, mainland Greece, cf. 13.11.2, 13.54.2, 13.54.6, 13.55.2, 13.56.3. Plutarch, *Life of Pericles* 27.3. On the screw see Dalley and Oleson 2003; on discoveries in the classical period a classic is Kleingünther 1933.

[16] The relief in Barnett and Falkner 1962: 172, plate 118; for an early claim that it resembles a catapult see Rawlinson 1879: 472. Stone balls from pre-Hellenistic sieges: Erdmann 1977: 80–2 and Maier and Karageorghis 1984: 192–203 (Paphos); Özyigit 1994: 90–1 and n. 20, Briant 1994 and *contra* Pimouguet-Pédarros 2000 (Phocaea); von Szalay and Boehringer 1937: 48–54 and Kohl 2004: 190–2 (Pergamon); Laurenzi 1964: 148–9 (Rhodes); Stern 1994: 157 (Dor in Israel).

[17] Pimouguet-Pédarros 2000: 24–6. Athenaeus Mechanicus 37 mentions enormous stones and column-drums dropped from the battlements.

[18] Thucydides e.g. 2.18.1, 2.75–6, 3.51.3, 4.13.1–2, 4.100.1–4, 4.115.2–3, 5.7.5, 6.102.2, 7.43.1 mentions several types of devices, collectively called *mechanai* or *mechanemata*, and deployed in sieges by practically all sides: battering rams, incendiary devices, ramps, mines (sometimes in response to ramps), shields or 'tortoises'; Marsden 1969: 49; Garlan 1974: 136–47; Pimouguet-Pédarros 2000: 15–18.

Polybius (200–118 BC), normally very interested in technical matters,[19] nor even the technical writers themselves, some earlier than Polybius, report it?

Perhaps the catapult was a Syracusan re-invention or modification of an already existing Punic weapon. Remember that some of the technicians summoned by Dionysius were from the Carthaginian territories; we are also told that the gathered taskforce at Syracuse copied models of weapons from all over the world thanks to the presence of many mercenaries living in the city.[20] Given the current state of the evidence, however, the question of whether the catapult, and what catapult, was invented in Syracuse in 399 BC is bound in my view to remain open.[21] There may be more mileage in trying to understand why Diodorus, whose report is too often unquestioningly accepted by modern historians, was interested in invention stories at all.

THE TECHNICAL REVOLUTION: DEVELOPMENT

Once discovered or re-discovered, the catapult appears to have spread from the Western to the Eastern Mediterranean, presumably through artillery experts who were recruited, 'transferred' as part of inter-city alliances or captured and induced to collaborate.[22] By the third century BC, if not before, the catapult seems to have been a common sight, and it was not unusual for even small communities to have access to enough resources and expertise for the 'new' weapons to be at their disposal. There is epigraphic evidence that the Athenians had some kind of catapult by 370[23] and we are told that the town of Sinope on the Pontus Euxinus, expecting Mithridates' attack and siege in 220 BC, was helped by Rhodes with gifts of wine, suits of

[19] Polybius 1.22.3–23.10, 1.26.10–16, 8.4.3–11, 9.41.1–12, 18.29, 21.7.1–4 (cf. also Diodorus 17.44.4, 20.88.2), 27.11.

[20] Diodorus 14.41.4–5.

[21] With varying positions Marsden 1969: 48–9, 53–5; Winter 1971: 312–17; Garlan 1974: 122–5, 139, 157–8, 160, 164–6; Ober 1987: 571; Milner in McNicoll 1997: 209–10, 212; Pimouguet-Pédarros 2000; Dalley and Oleson 2003: 4–5; Russo 2004: 61, 71; Greene, forthcoming, on the problems of identifying inventors in the ancient world.

[22] E.g. Polybius 10.17.9, 20.4–7, 36.6.5, cf. 36.6.7; Diodorus 20.48, 20.91.8, (fragments) 22.8.5. Winter 1994: 32 and Rihll (personal communication) are more sceptical than most about how quickly the use of the catapult spread.

[23] Or by 377 BC, if we read Diodorus 15.34.4 (*mechanai* used to shake the walls of Naxos) as referring to catapults, although it more likely refers to rams; *IG* II^2 120, 36 ff. (362/1 BC); *IG* II^2 1422 (371/0 BC,); *IG* II^2 1440 (350/49 BC). *IG* II^2 1467, lines 48–56 (330 BC); *IG* II^2 1469 (320/19 BC), lines 72–3, 77–80; *IG* II^2 1475 (318/17 BC); *IG* II^2 1488 (end of fourth century BC); *IG* II^2 1490 (end of fourth century BC), line 32; *IG* II^2 1627 (329/8 BC), lines 328–41; *IG* II^2 1628 (326/5 BC), lines 510–21; *IG* II^2 1629 (325/4 BC), lines 985–98; *IG* II^2 1631 (324/3 BC), lines 220–9. In general, see Marsden 1969: 57, 61, 65–6; Cole 1981 suggests 363/2 BC as another possible date for *IG* II^2 422.

armour, gold pieces, 'prepared' hair and sinew (both evidently for catapult springs), and four stone-throwers complete with artillery specialists (*aphetas*).[24] When Rhodes in her turn asked for help following a disastrous earthquake in 224 BC, the kings of Syracuse donated (along with oil, silver cauldrons, money, and relief from harbour customs) fifty three-cubit catapults, but, note, no artillery men to operate them, presumably because there was no shortage of local experts.[25] Indeed, when many years before, in 305 BC, Rhodes was about to be besieged by Demetrius Poliorketes 'since the multitude were of one mind, the rich contributed money, while the technicians offered their knowledge for the constructions of the weapons, and all were active, keen in the love of honour to surpass the others'.[26] In 318 the people of Megalopolis, hearing that an attack was imminent, called in the inhabitants from the countryside, organized the workforce into teams and set to work: digging a moat, building a palisade, repairing the walls, making weapons and building arrow-shooting catapults.[27]

The path of the catapult from Syracuse to Megalopolis has been described by modern historians, the most influential of whom is probably still Eric Marsden, in terms of progress or, more simply, of development.[28] Marsden proposed a linear, cumulative model with improvement over time, where non-torsion catapults were supplanted by torsion catapults between 325 and 300 BC, specifically at the hands of the engineers of Philip II of Macedonia (who ascended to the throne in 360 BC). He stated:

> since the beginnings of the industrial revolution in modern times, scientific and technological developments have been taking place with ever increasing rapidity. Many people believe that in the ancient world this sort of progress was extremely slow, insofar as it took place at all. [. . .] But military technology progressed in Macedon for a period of less than twenty years with such steadily increasing momentum that we may reasonably recognise it as a situation noticeably anticipating to some degree the many examples of similar technological development in the twentieth century AD.[29]

The fundamental steps in Marsden's story are the move from combined bow to belly-bow (the *gastraphetes*, which Marsden thinks is the object of Diodorus' story), then the addition to this latter of a winch (to pull back the arms) and then a base (for stability), at which point the belly-bow

[24] Polybius 4.56.1–3, cf. 5.89.9, 5.89.3. [25] Polybius 5.88.5–7, cf. 5.89.1 and 8.
[26] Diodorus 20.84.4–5. [27] Diodorus 18.70.1–3.
[28] Russo 2004 does not seem to have had much of an impact so far. I am looking forward to the publication of Tracey Rihll's on-going research on the topic.
[29] Marsden 1969, 1971 and 1977: 212 (quotation); 216–17. *Contra* Russo 2004: 3, 7, 61, 69.

effectively became a non-torsion catapult. Further reflection led to the identification of sinew as the material in the composite bow that provides the most power, thus precipitating the addition of torsion springs, made from sinew and aimed at injecting more force into the weapon's arms. The torsion catapult was born. Over time, ancient technicians also came to the realization that all the parts of a catapult were in proportion, and formulated mathematical statements expressing such proportionality. One element or standard module was identified – the diameter of the cylinder holding the spring – on the basis of which technicians were able to express complete specifications for the whole engine.[30]

Marsden's model has not substantially been challenged, with few exceptions. Yvon Garlan, for instance, thinks that, rather than cumulative, the development of the catapult could have 'connu une série de bonds et de régressions spectaculaires', and that the engines invented in Syracuse in 399 BC may have already been torsion catapults. He is followed in this by Tracey Rihll and Flavio Russo, for whom the Syracuse innovation may have been the fusion of two archetypes (non-torsion two-armed arrow-shooter and torsion one-arm stone-thrower), in itself novel enough to impress the Carthaginians at Motya, as Diodorus reports.[31]

Nonetheless, swapping a linear, cumulative model for a 'fits-and-starts' model is not entirely satisfactory. Garlan and Russo still do not seem to problematize key assumptions, such as that technology moves in a certain direction (progressively if going towards what we would agree is efficient or better, regressively if not), or indeed that it 'moves' at all. A recent statement on the issue reveals the persistence of criteria, such as simplicity, which are still taken by historians to be context independent. According to Pimouguet-Pédarros, the arrow-shooter must have preceded the stone-thrower, partly because the term 'stone-thrower' appears later than 'arrow-shooter' in the literature, but mostly (and more importantly for us) because the arrow-shooter is technically simpler. The propelling system for a bolt is less complex and less powerful than what would be required for a heavier stone ball. It is also allegedly simpler from the point of view of the evolution of weaponry, since stone-throwers, being used to batter down walls or other machines, 'témoignant d'un degré d'évolution de la guerre supérieur aux armes antipersonnel', i.e. arrow-shooters.[32] Unfortunately,

[30] All summarized by a table at Marsden 1969: 43.

[31] Garlan 1974: 167n. 6, 168, 227; Russo 2004: 43–5, 53–61, 64; Rihll in private communication. See also Winter 1970: 268–9; Snodgrass 1971: 108. For recent discussions of innovation in antiquity, see Dalley and Oleson 2003; Stein 2004; Greene forthcoming.

[32] Pimouguet-Pédarros 2000: 10.

the history of technology is replete with cases where more 'complex' or 'baroque' solutions paradoxically precede 'simpler' ones.[33] The criterion of simplicity is simply not universal or absolute, and before applying it to ancient technology we should explore whether and in what form it was present then.

How can we decide whether ancient catapult-building was progressive over time or proceeded by fits and starts? Can we find support for either model in the evidence? Let me note first of all that the relevant archaeological evidence, principally fortifications, catapult pieces and missiles, is difficult to date independently of a model, and consequently cannot really be used to decide the question.[34] Most modern experts on ancient fortifications appear to have adopted a progressive, linear model for catapults. That has led them, for instance, to dating towers that can apparently accommodate torsion stone-throwers to a later period than towers that can only fit small, non-torsion arrow-shooters. To spell it out, the assumption behind this is that new, better technology makes older, less efficient technology (and the system that goes with it) almost automatically obsolete and replaces it entirely within a relatively short period of time.[35]

Given the problems with the interpretation of archaeological evidence, I will address the question above by reviewing the textual sources, primarily the writings of historians and technicians.

For a start, it is true that, while he attributes generic 'machines' or 'instruments' to, for instance, the Carthaginians,[36] with Philip II Diodorus talks explicitly of arrow-shooters. We are at the siege of Perinthus in 341 BC, and the Macedonian king is said to have used *mechanai* – specifically towers higher than the fortifications themselves, battering rams, and 'many and varied arrow-shooters'. But Philip is not the only one with new weapons: we are told that Perinthus had received reinforcements of men, artillery and

[33] See the examples collected in Collins and Pinch 1998; MacKenzie and Wajcman 1999.

[34] The most common catapult remains are washers, i.e. thick metal rings which were situated at the bottom and the top of each spring-bearing cylinder in a torsion catapult. The function of a washer was to hold the spring in place after it had been twisted; this was done by wrenching it in place either with the help of a pawl (if its rim was toothed – at least that's how I understand Baatz 1982: 152), or pinning it (if its rim had holes). For a list and a typology of extant identified washers see Baatz 1994a; also Williams 1992: 181–2; Russo 2004: 1–4, 8, 170–1.

[35] Marsden 1969: 116–17 proposes a developmental model for fortifications, analogous to the one he has for catapults. Ober 1987: 571–2, 596–600, 1992 147, 150–1, 162, has a two-phase model for fortifications which depends on his acceptance of Marsden's dating for the passage from non-torsion to torsion catapults. Also Winter 1971: 95–100, 155, 156, 218–20, 1992: 208 and 1994: 30, 35, 40–2; McNicoll 1997: 3, 41, 71, 73–4, 101–3. Baker 2000; van Wees 2004: 144, 236–8. Another field of technology which may have been affected by developments in artillery was naval architecture: Marsden 1969: 173.

[36] E.g. Diodorus 13.85.5, 14.7.3.

catapults from Byzantium – an indication that the technology and probably the relative expertise had already spread to various parts of the Eastern Mediterranean (if not to Perinthus yet).[37] Crucially, however, we have no clear indication of a switch from non-torsion to torsion engines. Philip's arrow-shooters at Perinthus may have been just as well non-torsion engines – indeed, he wins because of superior numbers, rather than because of better technology.[38]

The earliest mention of stone-throwers, and thus probably the earliest mention of torsion engines, is actually – as far as I know – in relation to Philip's son Alexander the Great and his siege of Tyre in 332.[39] One could see the mention of stone-throwers as an indication that the Macedonian engineers had, given appropriate monetary and status incentives, come up with a significant invention, or at least a major improvement on an extant device. And yet, in Diodorus' account of the siege, it is the Phoenicians – the Tyrians – who are portrayed as the real technical experts. 'They had plenty of catapults and other machines useful for sieges and they easily constructed even more because of the machine-builders and other technicians of all sorts who were in Tyre. They constructed with their inventiveness all sorts of strange instruments.' Indeed, when at some point the Tyrians send boats to interfere with the Macedonians who are building a mole in the harbour, those boats are equipped with arrow-shooters and what might even have been small non-torsion stone-throwers.[40] Explicitly mentioned stone-throwers (*petroboloi*) finally make their entrance on the Macedonian side only when a gale destroys part of the mole, causing a situation of impasse (*amechania*), and consequently spurring Alexander's love of honour (*philotimia*).[41]

It would seem then that what appears such a dramatic step to modern observers – the move from non-torsion to torsion engines – barely registers on the radar even of discovery-happy Diodorus. What little we can infer from ancient accounts of sieges presents different emphases from what modern historians of technology have seen as important. But what about ancient technical writers? I will look at four treatises: Philo of Byzantium's *Construction of Catapults* (dated at c. 240 BC or later in the third century), originally the fourth part of a larger work called *Mechanical Syntaxis*;

[37] Diodorus 16.74.2–5, 75.3.

[38] Diodorus 16.3.1–2: Philip of Macedonia the first to put together the Macedonian phalanx. Why not mention that he was also the first to use the torsion catapult, if Diodorus knew about it?

[39] Cf. Diodorus 17.9.6, 17.22, 17.24.3–27.6, esp. 24.4–6 and 26.6, 17.85.7.

[40] Diodorus 17.41.3–4, 42.1: the engines on boats are 'arrow-shooters and catapults' – but why differentiate if they were all arrow-shooters? Cf. also Diodorus 17.43.1, 17.43.7, 17.44.1.

[41] Diodorus 17.42.6–7, 17.45.2, 17.52.2, 18.26–28.2.

Biton's *Construction of War Instruments and Catapults*, addressed, probably, to Attalus I of Pergamon and thus dated to around 241–197 BC; the tenth book of Vitruvius' *Architecture* (late first century BC); and Athenaeus Mechanicus' (so called to distinguish him from the other Athenaei of antiquity) piece *On Machines*, written perhaps at some point in the second half of the first century BC.[42] Not all these authors are interested in developmental matters or in discovery stories, which again marks a significant shift in emphasis compared with modern historians, or for that matter with Diodorus himself.

Philo's treatise, like other parts of the *Mechanical Syntaxis*, is addressed to an otherwise unidentified Ariston, and aims to provide not just a description of the catapults, but also a method to build them, since, Philo says, earlier treatises recommended different methods and different specifications.[43] The narrative sets a distinction between past and present, in the form of on the one hand, earlier and on the other hand, more recent, writers and technicians. Philo privileges those latter because they have achieved actual results.[44] The transition between past and present is slow and cumulative: Philo cites the sculptor Polycleitus to the effect that 'the good/beautiful (*to eu*) originates little by little through many numbers'[45] and then explains how the people who started to understand that the hole of the spring carrier was the element or standard (*stoikeion*) had to establish it not by chance (*tyche*), but with a firm method that would produce the same result every time. This firm method was achieved through experience (*peira*) – not the experience of the earlier technicians, who did not have many facts (*erga*) to build on, but that of more recent contributors, who learnt from previous mistakes, identified the element and fully understood the construction. 'It so happened that the technicians in Alexandria did this first, having obtained great abundance thanks to kings who loved reputation and the *technai*.'[46]

[42] On Philo, Marsden 1971 – on dating specifically 6–9: Philo's dating is tied to that of Ctesibius – and Ferrari 1984. On Biton, Marsden 1971: 6, 78n. 1: the addressee could be Attalus I, II or III, but Marsden inclines for Attalus I, mostly because Biton only describes non-torsion catapults, which would have been outdated at the time of the later monarchs. Lewis 1999 dates Biton to 156/5 BC, but I do not find his case entirely convincing. On Vitruvius, E. Romano in the Italian translation 1997: 1293–7. On Athenaeus see the new edition and translation by Whitehead and Blyth – on dating 15–20: the treatise is dedicated to M. Claudius Marcellus (42–23 BC), nephew and putative heir of Augustus. Athenaeus was unjustly implicated in Murena's conspiracy but his innocence was apparently proved; he is mentioned by Strabo (if it is the same Athenaeus) as a Peripatetic.

[43] Philo of Byzantium, *Construction of Catapults* 49.1–9.

[44] Philo of Byzantium, *cit.* 49.9–11, 50.30–51.1, *Fortifications* 1.5, 59, 3.30.

[45] Philo of Byzantium, *Construction of Catapults* 50.6.

[46] Philo of Byzantium, *cit.* 50.14–24, 24–6 (quotation), 26–8, 51.1–2, 52.21, 59.9–10, 69.8–20, 71.17–72.4. On the diameter of the hole-carrier as the main element, cf. Vitruvius 10.10.1, 10.11.1–2; Russo 2004: 15.

This is a discovery story, and Philo is explicit on the positive value of making discoveries:

> one must praise those who at the beginning discovered the construction of these instruments; for they were the originators of the thing and of its shape, they discovered something superior to all other artillery, I mean like the bow, javelin and sling, in length of the shot and weight of the projectiles. To devise something at the beginning and to realize the device is of a superior nature; to bring to correction or adaptation something that exists seems rather easy. But, though very many years have passed since the putting-together [of the machine] happened to be discovered and there have been, as usual, both many machine- and catapult-makers, no one has dared to depart from the established method. We were the first to do so.[47]

As I have already noted, however, Philo does not mention Syracuse or Dionysius, or the shift from non-torsion to torsion catapult. His story is cast in epistemological terms, including a contrast between *techne* and *tyche* similar to what we discussed in chapter 1. His *techne*, Philo says, can be obscure and indetermined for the non-expert. In the past people have produced very different machines even using the exact same specifications and materials, and, when asked how this happened, they were not able to give a reason why.[48] For Philo the discovery of the standard for catapult construction is thus not so much the culmination of a search for the best performance,[49] but the establishment of a reliable explanation for the functioning of a particular device; it is the growth of his own brand of *techne* into a form of knowledge that can oppose chance, is able to give an account of itself and can satisfactorily fit with mathematical and physical theories.

No such claims are found in Biton, who more modestly collects and describes devices built by other people, selecting what might be most suitable for Attalus:[50] a stone-thrower built by Charon of Magnesia in Rhodes, another built by Isidorus of Abydos in Thessalonica ('since different types of instruments suit different places'), a *helepolis* (siege-tower) built for Alexander the Great by Posidonius the Macedonian, a *sambuka* (scaling ladder) by Damis of Colophon, and two types of belly-bow made by Zopyros of Tarentum, one for the Milesians and one for the people of Cumae.[51] No temporal or developmental dimension is given by Biton. He refers to the fact that the instruments he describes can be used for defensive

[47] Philo of Byzantium, *cit.* 58.26–59.1, tr. Marsden with modifications, 68.15–18.
[48] Philo of Byzantium, *cit.* 49.12–50.6. [49] *Pace* Marsden 1969: 24–5, 37–9.
[50] Biton 67. [51] Biton, 45, 49, 52, 57, 62, 65 respectively.

or counter-offensive purposes, and this could indicate a later, 'reactive', stage of the military revolution, but it is more likely to be a common *topos* in the 'just war' rhetoric that was widespread at the time.[52]

Moving to the first century BC, Athenaeus states: 'I have taken a personal pride (*pephilotimemai*) in enlarging the resources of what is useful for machine-making. For one must not only know the fine discoveries of others; rather, since there is agility in the spirit, one must discover something oneself.'[53] He also reports how the Carthaginians first discovered the ram, thanks to some young men who, needing demolition equipment after the capture of a city, took a beam and started shaking it against the city walls. A shipwright from Tyre then reproduced this idea with two shipmasts and a pulley at the siege of Gades, causing helplessness (*aporia*) among the besieged because of the strangeness of the device. Athenaeus mentions Dionysius and Philip II, who are said to have made progress (*epidosis*) in all mechanical construction, but he does not attribute any specific invention to them and crucially, pairs their names with those of their technicians: Polyeidos and, for Alexander the Great, Diades and Charias.[54]

A contemporary and possibly a rival of Athenaeus', Vitruvius is usually very interested in the origin of artefacts and their role in the development of civilization. Indeed, he reports the same discovery story for the ram as Athenaeus, agreeing with him on details such as the names of the people involved.[55] All the more surprising, then, that he says nothing about the journey of the catapult from bow to *ballista* (the Latin term common by his time for a stone-thrower). He points instead to a diffused situation, where, despite their being built for one purpose, '*ballistarum* [. . .] *rationes variae sunt et differentes*'. He mentions in particular the variety of mechanisms employed to twist the springs.[56] It is in fact Hero of Alexandria in the first century AD who provides the most complete developmental story of all, starting with the basic human need to throw things at a distance, and charting the parallel growth of human needs and catapult technology over time.[57]

Clearly, any notion of development will be affected by whatever direction one thinks the development is proceeding towards – what the aims of a certain technology are. One of the pitfalls of reconstructing previous technologies is that assumptions must be made about, among others,

[52] *Pace* Lewis 1999. Biton 43–4. Cf. Athenaeus Mechanicus 39; Vitruvius 10.10.1, 10.12.2.
[53] Athenaeus Mechanicus 31–2, tr. Whitehead and Blyth with modifications. He might be referring to the device he describes straight after this passage, to be used on ships and called 'the little ape', of which he probably gives an illustration, if not a diagram: 32–3, cf. also 37. Diagrams mentioned at 39.
[54] Athenaeus Mechanicus 9–10. [55] Vitruvius 10.13.1–3.
[56] Vitruvius 10.11.1. [57] Marsden 1971; Cuomo 2002.

what a certain technology was *for*. Inevitably, especially in situations where little evidence is available to illuminate us, aims tend to be taken as context independent, and in particular as resembling what would be the case for the modern equivalent of the technology in question. For instance, it is often arbitrarily assumed that the designers of an ancient catapult would have the same goals as the engineers who devise modern artillery. Even within the ancient context, however, the question is not so simple. For a start, differences must be made between different technical writers. For instance, treatises like Hero's and Philo's put forward different aims for catapults, which is not surprising if we consider that they are centuries apart and written against completely different political backgrounds – Hellenistic kingdoms for Philo and the Roman Empire for Hero. When promoting his own arrow-shooter, Philo writes:

> first, [it] has a good reputation in what most attracts people's love of honour and what they would exchange anything for: it can throw far. Secondly, it remains strong and firm in battle. Moreover, it is easily constructed and does not require much handling. Next, it is easily strung and easily put together; similarly, when necessary, easy to take apart. Moreover, it has an appearance by no means inferior to the others and, on all counts, it produces less expense. These are the main points.[58]

Modern analyses have pointed out that strength of impact ought to be the main concern of a catapult-builder, because range counts for little if your one-talent stone ball packs little energy by the time it gets to the enemy's walls. However, what one does find in Philo, despite evidence that he was aware of the trade-off between range and force, is that range was paramount; moreover, the aesthetics of the machine played an important role, almost as if appearance was an integral part of efficacy. This is not an isolated example: think of Demetrius Poliorketes' big and mighty engines, or imagine the sun flashing ominously on the copper-laminated cover of the Roman catapult found in Cremona – poignantly, Philo's treatise kicks off with what is almost a motto, not by an engineer, but by a famous sculptor.[59]

On the whole, in the picture that emerges from the technical writers, we do have evidence of a development, and discoveries are definitely valued,[60]

[58] Philo of Byzantium, *Construction of Catapults* 56.18–25, tr. Marsden with modifications. Cf. also *ibid.* 51.8–10: the aim of belopoetics to shoot far *and* powerfully, 53.20–1, 53.27–9, 56.25–58.25, 57.1–3, 59.2–62.24, 62.20–1, 76.21–6; Diodorus 20.86.2, 20.88.2; Baatz 1994b.

[59] Philo of Byzantium, *cit.* 66.17–21. The Cremona catapult in Baatz 1980; cf. also Aristotle *Politics* 1331a13. Despite this aesthetic dimension, we do not find many representations of catapults in the art of the period: Radt 1988: 179–90; Childs and Demargne 1989: esp. 263–70.

[60] Cf. also Xenophon, *Cyropaedia* 1.6.38; Plutarch, *Comparison of Philopoimen and Flamininus* 2.3. At the same time, political innovation is generally bad (in Aeneas Tacticus, 31.16 'those who want to *neoterizein*' are dangerous internal enemies).

but both in a way that does not exactly map modern notions, and therefore does not unproblematically support modern developmental models. Those ancient writers who introduce a chronological dimension to their account tend to emphasize the epistemological, rather than functional, dimension of development. Those who do not introduce a chronological dimension to their account draw on available technologies as if there was a collective reservoir of resources, where designs that we would arrange along a progressively orientated line existed instead side by side. In the technical writers, discovery often seems a matter of adapting and tweaking, or improving, extant designs, rather than producing something completely new, and this on the basis of aims, like the looks of a weapon, which are not necessarily ours, and not necessarily shared even by other ancient authors.

Given this scenario, I think that a 'scatter' model would best reflect what was going on at the time. Let us set aside the question of the actual origin of the catapult – in history of science parlance, let's black-box it. Let us take it for granted that catapults appeared or re-appeared in some form around the fourth century BC, probably starting from the Western Mediterranean, in order to meet the changed military demands of the period, and let us concentrate on the aftermath: from a certain point in time, let's say 370 BC, we find catapults in one form or another everywhere. From that point onwards – and we can take the end point to fade well into late antiquity[61] – in my view we do not have enough evidence to say that there was a linear, cumulative development from less efficient to more efficient catapults, or even a fits-and-starts development in possibly the other direction. What we find is, simply, that different types of catapults – those that we would consider more primitive and those that we would consider more advanced, and, more importantly, those that the ancients would have considered more primitive or advanced – co-existed and kept being produced at the same time. The co-existence of different 'stages' of a technology is an extremely common phenomenon, and it does not require more explanation (let alone the invoking of a *blocage*) than the fact that, as of 2006, despite the introduction of the internet-connected mobile phone, many people still write letters by hand on paper.

The term 'scatter' model then refers both to the fact that there was a variety of 'older' and 'newer' catapults, or more generally siege engines, being employed at the same time, and to the fact that these technologies were geographically scattered. I imagine a situation where we have a

[61] The catapult remains from Romania and Iraq are late fourth and third century AD, respectively: Baatz 1978.

number of points or clusters of technology with varying accompanying circumstances – some with, for instance, a greater concentration of financial resources, some with a smaller number of available experts, some with easy access to some materials, some not in a position to take their own decisions when it came to war policy.[62] A linear model would seek a way to connect the dots, as it were, which can only be done, as I have argued, by making a number of problematic assumptions, whereas a scatter model may choose to accept the fact that the evidence is scattered and insufficient, and leave the dots unconnected. Take the fact that, although we know that there were research centres such as Rhodes and Alexandria, and we know something about some technicians' travels, from quite early on we find sieges and siege technology in some far-away places. When it even acknowledges the existence of these peripheral cases, a linear model tends to make a simple connection between big centres and more advanced technology, and small towns and more primitive technology. A scatter model envisages instead something more similar to Darwin's Galapagos islands, and their different, yet related, populations of birds. Depending on circumstances such as ease or, on the contrary, impossibility of communication between different geographical areas, Darwin's avian populations developed in very different ways – adapting to the individual environment of their island or part of island. Similarly for catapults: no matter how catapults got to a certain place (remember that we have black-boxed the issue) changes were introduced at the local level, or not, in different ways and depending on different circumstances, so that at any given time we find catapults that seem to belong to different phases of development cohabiting. We also find that little modifications were introduced to some elements of a catapult that did not necessarily spread and may have been local, rather than disseminated from one of the big centres.

A good example of that (what is sometimes called 'Creole' technology)[63] could be the so-called Casalbordino cylinder – probably the top end of a winch, perhaps for an arrow-shooter. It consists of two concentric cylinders, with a rim closed on one side and decorated with a bejewelled woman's head in high relief. The basis of the object has a series of regularly spaced square holes which cut across both cylinders and are inscribed with Oscan–Samnite letters, in alphabetical order. The woman's head, based on the style and earrings, can be linked to Tarentine art from the fourth

[62] For a recent survey of these issues in the history of technology in other periods, see Edgerton 2006, esp. chapters 1 and 2.
[63] Edgerton 2006: ch. 2.

century BC – indeed, a political connection existed at the time between Samnites and Tarentines. The woman may even be Artemis, the archer goddess, an allusion to the power of the arrow-shooting machine of which it was part.[64] As I said, the Casalbordino cylinder could be a typical example of Creole technology – no such object is described in our texts; its design may have been devised by a local technician, and is in fact 'localized' by the alphabet letters inscribed on it. Even the siege this object may have been used in was, from a certain perspective, peripheral or marginal, not one of the big events described by Diodorus or Polybius. And yet, what grounds would we have for locating the Casalbordino cylinder at one end or another of a linear, progressive model? Does the fact that it may have belonged to a relatively small arrow-shooter rather than a stone-thrower make it 'primitive'? Or should we concentrate on the sophistication of the mythological allusion its decoration could be conveying?

Similar questions can be asked about washers, the most numerous category of catapult-related archaeological evidence to have survived.[65] There are different sizes of washers, corresponding to different sizes of catapults (remember that the diameter of a washer gives us the standard unit 'element' for the dimensions of the whole engine). Washers come in at least two main designs, toothed and holed, with several variations on each design (e.g. number of holes or distance from each other), for a total of at least seven types, although our written sources do not indicate that there was more than one type.[66] Such variety is found at peripheric sites: the washers from Ephyra in Epirus, for instance, provide evidence for some seven different types of catapults, at least one of which could have been a prototype.[67] This again points, in my opinion, to a scatter model, which would fit well the presence of relatively minor design variations (six holes instead of twelve, triangular instead of quadrangular teeth), whose significance from the point of view of efficiency, however defined, is far from

[64] Russo 2004: 26, 85–119: bronze, 10 × 8 × 11 cm. Casalbordino is near Chieti in Latium. The interpretation of the cylinder is not uncontroversial; according to others, it could be part of a mechanism for drawing lots: references in *Imagine Italicae* at http://icls.sas.ac.uk/imaginesit/samples/histonivm001.html (last accessed 11/9/2006).

[65] I have not tested my model on fortifications because that would have been a book in itself.

[66] E.g. Philo of Byzantium, *Construction of Catapults* 57.17–21, 61.1–3, 62.17–19. For the washers see Schramm 1918 and Russo 2004: 138–45 for a new reconstruction; Beltrán 1976: 175–6, table 6 and Vicente, Punter, Ezquerra 1997: 197n. 14 for doubts on this report; Baatz 1985 and Russo 2004: 190–8; Cunliffe 1988: 8–9; Williams 1992; Vicente, Punter, Ezquerra 1997 and Russo 2004: 146–55; Gaitzsch 2005: 130–4; Rihll forthcoming. Kunze 1956 describes a ram's head in bronze found at Olympia; on siege engines and sanctuaries see Arrian, *Anabasis* 2.24.5.

[67] Baatz 1982 – cf. Williams 1992: 154–9, 186; Russo 2004: 188–9.

obvious. Minor design variations point instead to the human side of the picture: technicians travelling around, offering their services to different communities and patrons, would have needed somehow to differentiate themselves and their products in what would have been competitive markets.[68]

In conclusion, we cannot unproblematically talk of progress in relation to the technical revolution of the Hellenistic period, and consequently a scatter model arguably reflects the state of our evidence better than a linear one. We cannot unproblematically talk about discoveries either, because the evidence is too murky to allow us to do that, and also because discovery is not an obvious, straightforward phenomenon: it can be constructed in many different ways. Notoriously, historians of technology have for a long time privileged innovation and discovery over anything else,[69] and historians of ancient technology in particular have enthusiastically embraced the catapult revolution because it finally gave them the opportunity to show that the ancients were a bit like us: ready to invent, innovate, develop, progress and incentivize, especially when the goal was winning a war. Our ancient technical writers, on the other hand, even when they appreciate novelty (even 'strangeness') or identify a development within a technology, do not appear to share our notions of efficiency or innovation. The way a catapult looks may be as important as its accuracy; the path of the *techne* of belopoietics may culminate in mathematical formulas that in fact add little to what we would call better performance in the field; and novelty may have consisted in tweaking the design of a washer for an arrow-shooter even as all-powerful stone-throwers were available.

Getting back to Diodorus, his story has the ring of a morality tale about it. He presents Dionysius of Syracuse as, on the whole, not a very good general: the new weapons he strove so hard to procure did not lead him to long-lasting victory, neither over the Carthaginians, nor over his internal enemies.[70] In an exemplary episode, after the successful siege of Rhegium (accomplished in 387 BC by starving the city out, rather than through technical superiority), Dionysius punished the local *strategos* by tying him up on the highest of his engines and making him watch while his son was being drowned. But cruelty does not breed popularity. The defeated general was hailed as a hero by the rest of the Greek world, and Diodorus disapprovingly compares Dionysius' use of the spectacular

[68] Baatz 1994a: 279. Cf. Philo of Byzantium, *Construction of Catapults* 49.4–9.
[69] See Edgerton 1999; Greene forthcoming. [70] Diodorus 14.66.5, 14.68.7, 14.69.1.

element of siege engines to a theatrical display, almost as if one of the aims of the device, its very spectacularity, had been perverted.[71]

Dionysius' death is significant. It is a typical oracle-misinterpretation story: it had been predicted that the Syracusan tyrant would die having defeated his 'betters'. But, the oracle meant other poets (Dionysius dabbled in poetry), whereas he thought his 'betters' were the Carthaginians. Thus, Dionysius who, in a misguided attempt to escape death, throughout his life had been unwilling to clinch a victory over the Carthaginians, met his death after triumphing in a poetry contest.[72] We here have the paradox of a general so afraid of death as to deny the very goal of his military activities, i.e. defeating the enemy. In other words, Dionysius' military doings are tainted with misuse and misunderstanding of knowledge, in particular technical knowledge (divination itself was sometimes classified as a *techne*). If you remember his keenness to outdo Corinth, Syracuse's mother-town, in the field of naval technology, the whole discovery story of the catapult takes on a definite hubristic tinge. Interestingly, some of the other discovery stories in Diodorus also centre around morally ambiguous characters: Pericles, who is at times seen (for example by Plato) as the embodiment of technical, material progress over moral preoccupations, and Philip II, again not the perfect general, at least from a moral point of view. For instance, he is a little too ready to use corruption and bribes to win his wars.[73]

There has been a tendency to read the catapult story in Diodorus as a straightforward narration of technical discovery, because modern historians tend to project onto ancient sources the positive overtones we in our society generally attribute to discovery and invention. We could, however, choose to see it as a more sinister reflection on the moral ambiguity of artefacts (a running theme in antiquity, see chapter 1), especially when cast against the background of a wider change of which the technical revolution (if indeed there was one) was but one part.

THE MILITARY REVOLUTION: KNOWLEDGE

In Greek representations of war, there is a recurring contrast between Achilles and Odysseus, and thus between strength and craftiness, valour and wile. The terms of this contrast are also generally used to describe the military revolution of the Hellenistic period and its move from citizen-soldier to mercenary, amateur to professional, open-field combat to siege, fighting for one's city to fighting for money.

[71] Diodorus 14.112. [72] Diodorus 15.74. [73] Diodorus 16.54.3.

Yet, Greek and modern representations of war are, like all representations, liable to magnifications and elisions. Consequently, in a parallel to the technological revolution that was part of it, the military revolution should also be problematized.[74] As I have mentioned at the beginning, the idea of a revolution crucially depends on holding a certain view of the classical Greek way of doing war, which is itself a construction. Apart from the extensive presence of mercenaries before the Hellenistic period and of citizen soldiers after the classical age, the Athenian navy also offers a prime example of professionalism that predates the fourth century BC. One needed at least some experts on board a ship – the navy is perhaps the earliest context in which we find references to the *techne* of the fighters involved, be they the pilot or the rowers, who were, notoriously, members of the lower class, metics and even slaves.[75]

Another early testimonial that some phenomena associated with the Hellenistic military revolution had been afoot for some time comes from Xenophon, himself a mercenary. He explicitly sees the art of war as a *techne*, to the point of comparing a general to any *banausos* or doctor, who has to know the names of the tools of the trade, the way a general has to know the names of the officers under him, whom he uses as his tools.[76] One of Xenophon's emblematic good leaders, Cyrus, is shown *learning* how to become a general, through a long and complex process that includes building siege engines.[77] Both Cyrus and the reader are constantly reminded of the value of training both the general and the soldiers.[78] Indeed, Philip II and Alexander the Great are presented as keen to keep the soldiers well trained, and another famous Hellenistic warrior, Philopoimen (253–184 BC), as making sure that the troops in his charge are constantly drilled.[79]

The widespread use of the catapult and other siege engines had further ramifications. New machines require new skills, in particular the ability to not just build, maintain and repair, but also effectively to operate them.[80] Perhaps one of the most surprising aspects of the Dionysius story, and one

[74] Hunt 1998 – for some qualifications of his overall argument see Ducrey 2000; van Wees 2004: 77–9, 85.

[75] E.g. Thucydides 1.142.6–9; Polybius 16.4.11, 16.6.6, 16.6.52–4; Loraux 1986; Hunt 1998: ch. 5; van Wees 2004: 209–14, 220, 229.

[76] Xenophon, *Cyropaedia* 5.3.47; Beston 2000: 317.

[77] Xenophon, *Cyropaedia* 6.1.20–3, 6.2.7, cf. also 1.6.12–14; Hunt 1998: 195.

[78] E.g. Xenophon, *Cyropaedia* 3.3.50–5, 6.2.15–19, 6.4.14, 7.1.39–40, 7.1.47–8, *Hipparchikos* 8.1.

[79] Diodorus 16.3.1, 17.2.3, 17.108.2–3; Plutarch, *Life of Philopoimen* 7.1–5, 9.1–3, 9.8, 12.4, 13.3, 14.5. Cf. Xenophon, *Cyropaedia* 2.1.20–2, *Hipparchikos* 1.5, 1.8, 1.19, *Memorabilia* 3.1.5.

[80] Garlan 1974: 168, 207–11; Pritchett 1974: ch. 11.

that points in the direction of the discovery being in fact an improvement on existing weapons, is that no mention is made of special training for anyone to use the new weapons.[81] It seems likely then that the status of technicians, or at least of those who were able to meet the demand for siege equipment, went up in the course of the third century BC.[82] The very existence and survival of what are effectively the earliest non-medical technical treatises (Philo's and Biton's) should already point in that direction. Ancient historians of the Hellenistic period, on the other hand, seem interested in registering more the collective presence of catapult experts than their individual names.[83] For instance, Diodorus mentions that, when the Rhodians intercepted some ships directed to Demetrius Poliorketes during the siege of 305, along with other things they captured eleven technicians with experience of catapults, who are termed 'famous' (*axiologoi*), and yet remain nameless.[84]

But both some epigraphic evidence[85] and the technical treatises tell a different story. For a start, Philo lists the specialized personnel necessary in preparation for a siege: cooks, doctors experienced in artillery injuries, and two types of machine experts: a machine-maker (*mechanopoios*) and men who must be competent enough in the *techne* to be able to operate the machines. Philo thinks every city quarter should be equipped with three catapults (one stone-thrower and two smaller engines), implying either that the men who could operate them would be distributed across the city, or that the skill to operate a machine was not so rare among average citizens.[86] Philo also recommends that the besiegers, when they arrive at the city, should announce, within earshot of the besieged, that anyone who will reveal the location of the stores of metallurgy tools, of machines and of similar, or anyone who will kill a *mechanopoios*, an artillery specialist or a notable will be handsomely rewarded.[87]

[81] Cf. Diodorus 14.95.1.

[82] Russo 2004: 5–7, 56–60, suggests that military technology had a closer relationship to 'civilian' technology than has been recognized so far.

[83] Archimedes is the main exception: Polybius 3.3, cf. 7.7, 5.1, 7.28.3–7, 8.37; Diodorus 5.37.4. Perhaps echoes of Archimedes in the siege of Tyre by Alexander: Diodorus 17.44.4–5. Cf. also Plutarch, *Life of Demetrius* 21.3.

[84] Diodorus 20.93.5; Plutarch, *Life of Demetrius* 16.2–3. See also Xenophon, *Cyropaedia* 3.2.11, 14, 6.2.33–4, 6.2.36, 6.2.37; Diodorus 14.48.3; Arrian, *Anabasis* 2.19.6, 2.21.1; Onasander, *General* 42.3. An analogous situation for fortification architects: see Maier 1959.

[85] Apart from the ephebic inscriptions, see below, we have *IG* II^2 1487 (307/6 BC), lines 84–90, 102; *IG* II^2 9979 (second half of the fourth century BC).

[86] Philo of Byzantium, *Fortifications* 2.5, 49, 3.26–7, 67–8, 72.

[87] Philo of Byzantium, *cit.* 4.12–13, 4.24.

A strong sense of the importance of the category of mechanicians and/or artillery specialists, and of their awareness of their own importance, also pervades Philo's text on catapults; technicians emerge as a loose network of people travelling and learning from each other between metropoleis such as Rhodes, Byzantium, Alexandria, Pergamon, but also much smaller cities, and theatres of military operations, in the wake of generals. Philo mentions that he spent time with the technicians in Alexandria and the architects in Rhodes and name-drops Polyeidos, and Dionysius and Ctesibius of Alexandria.[88] The same impression of a collective of technicians emerges from Biton's pages, as we have seen. As for Athenaeus, he establishes some teacher–pupil links within the network: he says that Polyeidos was successful at this *techne*, and that Diades and Charias were his pupils; as for Agesistratus, extensively quoted, he is the source of Athenaeus' own knowledge.[89] Among the authorities he has drawn on for writings on *machinationes*, Vitruvius names Diades, Charias and Agesistratus, as well as Archytas, Archimedes, Ctesibius, Nymphodorus, Philo of Byzantium, Diphilus, Democles, Polyeidos and Pyrrhus.[90]

All our technical writers have a manifest interest in impressing on their addressees – almost invariably people in positions of power and military responsibility – that what they do is important, nay, necessary. They deploy complex strategies of inclusion (provision of technical details, mathematical proofs, lists of specifications) but also exclusion (conjuring up networks or genealogies of technicians, implying tacit knowledge).[91] Given that hardly any text is aimed just at the specified addressee, this double strategy would have had the effect of appealing both to patrons and to fellow technicians. That this collective of technicians was stratified can be inferred from the existence of specification lists for catapults, which automatically create a distinction between those who were able to produce them, those who were skilled enough to use them, and those who were not able to use them at all. All the more intriguing, then, that arguably at least a

[88] Philo of Byzantium, *Construction of Catapults* 51.10–14, 67.28–68.2, 72.22, 72.26–7, 73.21–2, 77.9–12, *Fortifications* 1.44, 59; Winter 1992; McNicoll 1997: 13.

[89] Athenaeus Mechanicus 5–6: Deimachus, Diades and Charias who went with Alexander and Pyrrhus the Macedonian, 7–8, 10–11: Diades, 15–16: Philo the Athenian (Whitehead and Blyth in Athenaeus 108–9 think this is a slip for Philo of Byzantium), 21: Hegetor of Byzantium, 27: Epimachus of Athens, 29: Ctesibius, 31: Pyrrhus, 39: the older (writers). Cf. also Onasander, *General* proemium 7–10.

[90] Vitruvius 7. preface 14, 10.15.2–7: Hegetor of Byzantium.

[91] Tacit knowledge in Philo of Byzantium: *Construction of Catapults* 56.6–13, see also 50.7–13, 54.19, 55.12–56.6; in Biton: 46, 54–5, 59, 62, 66, 67; in Athenaeus Mechanicus: 11–15, 19, 27; in Vitruvius: 10.10.6, 10.11.1, 10.16.1. Arguably, some elements of the text, such as diagrams, can work either way: diagrams in Biton at 48, 51, 56, 61, 64, 67 (for every machine); in Philo, *cit.* 62.14–15.

couple of the technical writers I have cited were not primarily artillery experts. Biton attributes all the machines he mentions to someone else; it is only when he explains how the problem of achieving the right height for a siege-tower can be solved through optics that he admits to any direct contribution to the subject.[92] As for Athenaeus, perhaps he was primarily a Peripatetic philosopher, who jumped on the bandwagon of military writing in an attempt to secure an influential Roman patron.[93]

Moving away from the technical treatises, there is epigraphic evidence that, from a certain point in time, some Greek cities (Athens, Samos, Tralles, Beroia in Macedonia, Koresia), which in some cases we know to have been already providing military training for their young men through the institution of the *ephebia*, added catapult shooting to the subjects of instruction. Ephebe training took place in the gymnasium, which was one of the most distinctive and central buildings in a community. The youths received a literary, not just a military education, and demonstrated it in public through displays and competitions.[94]

Of course, different cities tell different stories, also due to the accidents of survival of the relevant inscriptions. The ephebes' training in Athens seems to have changed dramatically from around 360 BC, and definitely by 336 BC.[95] Whereas (unlike Sparta) no official, city-directed military training existed before, it was now instituted, perhaps as a reaction to the defeat at the hands of the Macedonians at Chaeronea in 338 BC. The new institution 'drew a line under the ideology of amateurism which had so long been dominant in Greece [. . .]. More dramatically still, [it created] an egalitarian militia which in principle embraced all citizens, trained and equipped identically'.[96]

The material from Koresia dates from the third century BC; it regulates among other things three-monthly competitions in archery, javelin and catapult, with prizes for winner and second best. The prizes for catapult winners are overall cheaper than for the other specialities, and consist in a helmet and a pike and a pike, respectively.[97] Two inscriptions from Samos, from the turn of the third and from the second century BC, list the winners in a range of specialities: various types of running, javelin, archery, but, most importantly for us, the use of stone-thrower and catapult. The winners, divided into older

[92] Biton 53: he has written a book on dioptrics. Cf. Athenaeus Mechanicus 28.
[93] Whitehead and Blyth in Athenaeus Mechanicus, 7–8, 28–40.
[94] Gauthier 1995; Chankowski 2004: 60.
[95] Aristotle, *Athenian Constitution* (328–325 BC) 42.3, *Nicomachean Ethics* 1111a10.
[96] van Wees 2004: 89–95, quotation at 95.
[97] Dittenberger 1915: 958 = *IG* 12.5.647. Cf. Chankowski 2004: 61, 71.

and younger contestants, sometimes won more than one competition and/or more than once, 'specializing', as it were, in one form of fighting.[98]

Who taught these youths their new military skills? Even given the scarcity of the evidence, one can detect a subtle shift: ephebic inscriptions of the fourth century tend to honour the *sophronistes* (the superintendent of the youths in the gymnasium), but they do not even mention gymnastics teachers and cite a javelin teacher only once.[99] But from the third century BC, we have Athenian inscriptions that list and praise, along with the ephebes and the higher gymnasium authorities, the gymnastics teacher, the archery teacher, the javelin-man and the catapult-man. The teachers' names were perhaps arranged in some sort of hierarchical order, with catapult teacher usually after the archery and the javelin teacher, but before the *grammateus*. It is sometimes possible to reconstruct several generations of catapult-men from the same family.[100]

Cities that were not willing or able to implement modified training for their youths had to rely on imported experts for the use of the new weapons: for instance, a treatise between Theangela (an island in Caria) and Eupolemos, one of Cassander's generals who was besieging the city, specified what was to be done with mercenaries who had defected because the city could not pay them. They included *katapaltaphetas*, who were to receive four months' salary and thus appear to have been treated better than ordinary soldiers.[101]

But the catapult is only part of the story. The treatises on catapults are not the only technical works written in this period. We also have texts on poliorketics, such as Aeneas Tacticus' *On the Defence of Fortified Positions*. The treatise was apparently addressed to the ordinary man, on whose shoulders it fell to defend city, family and possessions.[102] Aeneas Tacticus

[98] Dittenberger 1915: 1061 = *IG* 12.6.1.183 and *IG* 12.6.1.179–82. Gauthier and Hatzopoulos 1993: 21 line 29, 85–7; Chankowski 2004: 59.

[99] Reinmuth 1971: 43, 132, 1974 with references.

[100] *IG* II² 665 (282/1 BC), lines 27–8 and 67–70: Mnesitheus of Mnesitheus; *IG* II² 944b (perhaps early second century BC): the name is missing (last four letters –δρος), son of Pedieos – this has been reconstructed by Meritt 1942 as Neandros; *IG* II² 1006 (122/1 BC), lines 34–6, 46, 65, 81–6: Kalkedon of Kalkedon from Perithoides; *IG* II² 1008 (118/17 BC), lines 39–40 and 131: Kalkedon from Perithoides; *IG* II² 1009 (116/15 BC), lines 22–3: Kallias of Aigiliea; *IG* II² 1011 (106/5 BC), lines 28, 60, 120: Kallias of Aigiliea; *IG* II² 1028 (100/99 BC), lines 53, 154: Kallias of Aigiliea; Reinmuth 1955: 231 line 138, 232 line 292: Athens, 127/6 BC: Pedieus; Reinmuth 1961: number 8, line 11: Athens, 186/5 BC: Pedieus of Neandros. The inscription in Reinmuth 1955 is pieced together from various fragments, of which the ones in Meritt 1942 and *IG* II² 1007 are two. Meritt 1933: no. 6 (Athens, c. 224 BC): Pedieus; Meritt 1942: 299–301 reconstructs a whole family tree for Pedieus.

[101] Rostovtzeff 1931; Robert 1936: 69–70 (no. 52), lines 12–17 (end of fourth to first half of third century BC); Couvenhes 2004: 83–6, 107–9.

[102] Aeneas Tacticus, preface. The surviving treatise was but one in a whole series: 'On preparations' (7.4, 8.5, 21.1, 40.8), 'On finances' (14.2), 'On encampments' (21.2), 'On things heard' (38.5). The author may be Aeneas of Stymphalos, who helped establish a democratic constitution at Sikyon in

captures a situation politically and militarily in flux. Mercenaries, a common presence, are by him perceived as in need of strict control, and most cities are depicted as being under the threat of internal discord.[103] From the point of view of warfare, he never envisages the situation of an open-field battle, or indeed a direct clash. It is all about skirmishes or raids, and about besieging and (much more often) being besieged. Most of the *mechanemata* he talks about – siege-towers, rams, tortoises and 'big things' – have been in use, he implies, for a long time, and his solitary mention of catapults (*katapaltai*) does not single them out.[104] Throughout the treatise, Aeneas emphasizes experience, preparedness and foresight over anything else. The good tactician is advised to build counter-rams or dig trenches, and to acquire some expertise of devices such as the 'most secret method of all for sending messages', or the water-clock.[105]

On the other hand, Asclepiodotus' general in the eponymous treatise is expected to have quite a lot of specifics at his fingertips: the distance between individual soldiers in any of several battle formations, the names of all the subdivisions of a regiment, the shape of cavalry layout. The treatise imparts specialized instruction, including the use of arithmetic, geometry, diagrams, detailed nomenclature, and has overall a very mathematized feel.[106] In his *General* Onasander also adduces mathematical considerations when telling the reader not to underestimate the number of troops which may be contained within an apparently small circular encampment, or again not to overestimate how many people may be within a camp bounded by a multi-angled palisade.[107] A knowledge of divination, geography and astronomy for accurate time-keeping is also to be expected of the leading man.[108] Most notably,

> the general uses the many and multifarious siege engines according to what he can (*kata dynamin*). It is not for me to say that he must use battering rams or siege-towers or *sambucae* or wheeled towers or covered pent-houses or catapults; these

367 BC: Bettalli 1990: 4–6; Vela Tejada 1991: 18–25. The general consensus is that the treatise was written between 360 and 346 BC: Vela Tejada 1991: 26–9; Whitehead 2001: 8–9. Polybius mentions Aeneas at 10.44.

[103] E.g. Aeneas Tacticus, 1, 2.1, 3.4, 9, 10, 11.1–2, 12, 13, 14.1, 17.1, 22.20, 23.6. Cf. Polybius 1.7.1–2; Diodorus 16.19; Couvenhes 2004: 97–9; Chaniotis 2005: 93.

[104] Aeneas Tacticus, 32, esp. 8, 33.1.

[105] Aeneas Tacticus, 31.16–22 (Loeb translation) and 22.24–5, respectively.

[106] Asclepiodotus, *Tactics* 4.3, 2.10, 7.2, respectively. The author was probably a pupil of the Stoic philosopher Posidonius, which dates him to the mid to late first century BC. Specialized instruction at e.g. 2.10, 3.1, 4.4, 7.4–10, *passim*. Cf. Plato, *Republic* 522e.

[107] Onasander, *General* 10.16, cf. also 6.1–4, 7.1–2, 10.2, 15.1, 21.1–9. The treatise, produced before AD 59, is addressed to Quintus Veranius, probably a Roman senator with a military background: proemium 1, 3, 4, 7, 8. Cf. Polybius 12.17–21.

[108] Onasander, *General* 10.25–8, 11.1–2, 19.3, 39.1–3.

very things depend on the luck, wealth and power of those who fight, and on the intelligence of those engineers who accompany [the army] in order to build instruments.

The general's role consists in positioning the engines and in making proper strategic use of them.[109]

An example of how leaders could fail at these tasks comes from Philip V of Macedonia, who in 217 BC advanced to besiege and capture Melitea, aided by surprise. His siege ladders turned out to be too short, and the attempt was unsuccessful. Polybius comments:

this is the sort of thing for which leaders are most exposed to criticism. Who could indeed not criticize those who with no foresight, without having measured the walls, precipices and the other things through which they wish to come in, without having observed these things, come to a town thinking of taking it at once? And they are equally blameworthy if they measure the walls, and then they assign the construction of ladders and similar engines as it comes, to random hands.

Especially, Polybius continues, since such mistakes create mistrust among the soldiers: 'commanders therefore should never embark on such deeds without proper thought. The method of taking measurements and constructing ladders and so forth is quite easy and infallible, if we proceed methodically'.[110]

To summarize so far, then, there are clear indications that from the mid-fourth century onwards, specialized knowledge and training, be it how to address the troops effectively or how to shoot a catapult, were seen as an important part of what it meant to be a good soldier and even more, what it meant to be a good general and leader of men. That we are in the presence of a revolution, however, can only be decided after we have constructed the classical period as a time when these things did not matter very much. It is not just that our classical writers and the modern historians that take them at face value may be interested in representing the golden age of Greece as the era of the amateur hoplite hero. Some Hellenistic authors and the modern historians who like the idea of revolutions may also be interested in representing the third century BC as an era of increasing military professionalism.

To the extent to which there *was* a Hellenistic military revolution, it was a technical revolution not just because it saw the rise of new machines, but also because it gave wider currency and respectability to some features

[109] Onasander, *General* 42.3–4 (quotation at 3).

[110] Polybius 5.98.1–11, Loeb translation with modifications. On the other hand, 5.99–100: Philip V was well prepared for another siege. Cf. also 5.81.7, 8.37.1–2, 9.19.5–9, 10.47.5–11.

essential to technical knowledge. It propagated not only concrete notions about how tall a siege-tower should be or what material is best for catapult springs, but also a more general belief that one *becomes* a good soldier and general through training and learning, rather than being simply born a warrior and leader of men.

THE MILITARY REVOLUTION: ETHICS

In his *Politics*, as part of his description of the ideal city, Aristotle talks about walls. Some people, he says, cling to the old-fashioned notion that cities aspiring to virtue (*arete*) should not have walls. That is all very well when the city's forces more or less match those of the enemy,

> but as it may possibly happen that the superior numbers of the attackers may be too much for the human virtue of a small force, if the city is to survive [. . .] the securest fortification of walls must be deemed to be the most warlike, particularly in view of the discoveries that have now been made in the direction of accuracy about catapults and engines for sieges. [. . .] For just as the attackers of a city are concerned to study the way in which they can gain the advantage, so also for the defenders some things have already been discovered and others they must look for and philosophize (*philosophein*) about.[111]

As in the Archidamus episode, Aristotle registers the presence of uneasiness about the relationship between catapults and *arete*. Although there is indeed ancient evidence of this shift in military mentality and attitudes, we must again emphasize that the traditional war ethos may have been as much a legacy of the heroic times past, as a construction of fourth-century critics of some aspects of the democratic constitution – in other words, a nostalgic myth.[112] Indeed, even some of the most quoted ancient statements may not withstand closer scrutiny. Take Polybius' remarks, apparently based on the historian Ephorus (c. 405–330 BC), that the ancients 'entered into a convention among themselves to use against each other neither concealed missiles nor those discharged from a distance [those things were regarded as fraud, *kakomechanein* – note that *mechanein* needs to be qualified to be bad], and considered that it was only a hand-to-hand battle at close quarters that was decisive'. It has been convincingly

[111] Aristotle, *Politics* 1330b33–1331a17, quotation 1330b38–1331a3, 14–17, Loeb translation with modifications, 1331a13. Cf. Garlan 1974: 102; McNicoll 1997: in. 1: Aristotle's hometown Stagira was destroyed by Macedonian siege weaponry in 349 BC.

[112] Polybius 13.3.1–8, 18.3.7–8; Plutarch, *Life of Philopoimen* 13.6; but see Xenophon, *Cyropaedia* 1.6.27–38, *Hipparchikos* 5.9–11. Garlan 1974: 20–1, 66–8, 98–9; Vela Tejada 1991; Hunt 1998: 9–11; Krentz 2000; van Wees 2004: 65–8, 115–17, 128 – I owe the basic idea here to van Wees.

argued that there was no archaic treaty, and that Ephorus, 'a proponent of limited warfare [. . .], who idealized the chivalrous agonal warfare of a distant past', conjured it into existence.[113]

In a form of elision analogous to early modern reactions to the existence of gunpowder, several of the poliorketics treatises quietly ignore the fact that catapults were extensively used. Aeneas Tacticus devotes all of one section out of forty to counter-devices (*antimechanemata*), being much more concerned about internal enemies and 'revolutionists' (a lovely Loeb translation of *antistasiotes*) than he is about machines throwing stones at the walls.[114] Asclepiodotus' *Tactics* is exclusively about troop arrangement and deployment – no machines are mentioned; and, while the last part of Onasander's treatise deals with sieges, again nothing more than 'a siege requires courage of the soldiers, strategic thought (*epinoia*), and provision of engines' is said.[115]

As we have intimated in the case of Diodorus and Dionysius, the use of technology is sometimes tainted with negative moral overtones. We have examples of 'bad' technicians: Heracleides from Tarentum, the son of 'banausic and manual-working people' and himself an architect, enjoyed a career punctuated by disloyalty and treachery.[116] And Agathocles, (another) tyrant of Syracuse, learnt the *techne* of pottery because his adoptive father was poor. His enemies would use 'potter' as an insult against him, but at a banquet,

> taking a great golden cup, [he] said that he had not given up the potters' *techne* until in his love of *techne* he had produced in pottery beakers such as this. For he did not deny his knowledge but on the contrary would boast of it, claiming that it was by his own virtue (*arete*) that for the most lowly position in life he had exchanged the most exalted one.[117]

To confirm his 'bad' credentials, Agathocles built a siege-tower and hung prisoners on its sides, forcing the besieged to shoot their own people in order to defend themselves.[118] Finally, the Lacedaemonian Phalaecus, who had been involved in desecrating Delphi and thus was in a way responsible for the Sacred War, 'constructed siege engines and was bringing them up

[113] Polybius 13.3.4, Loeb translation with modifications. Wheeler 1987: 182 (quotation).
[114] Aeneas Tacticus, 32 – see also 33–6, 38. Onasander mentions internal enemies only once: *General* 10.24. Bettalli 1990: 17–23; Whitehead 2001: 21, 25–9.
[115] Onasander, *General* 40.1 (quotation), 2–3. Bettalli 1990: 32–4.
[116] Polybius 13.4, cf. 38.12.5.
[117] Diodorus 19.2.7, 20.63.4–5, quotation 20.63.4, Loeb translation with modifications, 20.101.3. See also Diodorus (fragments) 21.17.3.
[118] Diodorus 20.54.2–7, 20.71.2.

against the city when lightning descended and they were consumed by the divine fire, and many of the mercenaries [and the general himself] in attempting to save the engines perished in the flames'.[119]

The picture may appear straightforward enough: we could describe this hostility to military technology as active marginalization, of a kind not dissimilar from what we encountered in chapter 1. Albeit technical knowledge at some level was recognized as necessary (as we saw in the previous section), at an ethical, intellectual level the ancients insisted that the moral dimension, and in particular the traditional moral dimension, prevailed over the new ways. A military revolution and a technical revolution there may have been, but the Greeks were clinging to their old values despite it all.

This picture is plausible, but again it is only part of the story. The ethics – mentality, attitude, values – of the Hellenistic military revolution was in my view rather more complicated. I think that at least some people, including military men, resolved the contrast between the old and the new, between innate and learnt, amateur and professional, not by actively marginalizing the new, the learnt and the professional, but by, perhaps opportunistically, embracing it. In so doing, they assimilated and appropriated characteristics that were more generally typical of the technical way of doing things. In other words, the military revolution had a strong technical component not just in how things were done (catapults and sieges), and not just in what things should be known or learnt (*that* they should be learnt, that one should learn to be a general), but also in how things were viewed or evaluated.

Some of the virtues associated with being a military leader seem to remain constant throughout antiquity: for instance, discipline (*eutaxia*)[120] and the willingness to face personal danger.[121] There are, however, virtues which the Hellenistic authors emphasized with increased frequency: in particular foresight (*pronoia*),[122] and associated faculties such as intelligence (*nous*)[123] or a capacity for calculation (*logismos*).[124] Experience (*empeiria*)

[119] Diodorus 16.63.3, Loeb translation with modifications.

[120] Chaniotis 2005: 51–3, 93–4.

[121] But Philo of Byzantium tells his addressee, Ariston, presumably a notable, not to endanger his own life because the deriving loss would be worse than any benefit: *Fortifications* 4.28; Garlan 1975: 146–8. Alexander the Great was famous for his willingness to face great personal danger: Diodorus 17.21.4, 17.33.5, 17.46.2; cf. also Polybius 10.32.7–33.7; Beston 2000: 321–2; Chaniotis 2005: 35.

[122] Philo of Byzantium, *Fortifications* 2.50, Polybius 5.81.7, 10.16.5, 11.2.6, 23.5.9; Diodorus (fragments) 22.3.1; combined with good fortune in Plutarch, *Life of Demetrius* 8.3; Chaniotis 2005: 33.

[123] Sometimes contrasted with *tyche*: Polybius 10.3.7, 33.10.6; Xenophon, *Hipparchikos* 7.1: *phronimos*.

[124] Polybius 3.89.4, 10.5.8, cf. also 10.9.2–3, 10.6.12, 10.11.8, 11.16.5, 16.2.5, 18.10.3; Diodorus 20.78.1.

and its opposite *apeiria* are key words, for instance, in Polybius, where they denote a form of knowledge (the Loeb translator often renders it as 'skill'). Experience is more than just having been through a lot of battles, but, rather, it conveys a capacity, or willingness, to draw lessons from having been through battles – a learning attitude.[125]

One passage in Polybius is particularly explicit. He lists *desiderata* for a commander: capacity to keep his plans secret, knowledge of voyaging by day and night and by land and sea, knowledge of the *kairos*,[126] knowledge of signals. 'Of these things, some are observed from practice, some from inquiry, some according to systematic experience.' It is better to have personal knowledge of the places involved;[127] alternatively, the general should opt for a careful *historia* by trustworthy third parties.

> Skill therefore in these and similar matters can perhaps be acquired by a general just through military practice, partly by personal activity, and partly through *historia*; but what depends on experience requires knowledge and theories, above all those in astronomy and geometry, which, while no great study of them is required for this purpose at least, are powerful for the enterprises we have talked about.[128]

The passage continues reiterating that commanders should have some knowledge of geometry, in particular of similarities and proportions, so as to be able to change the encampment plans.[129] Having compared the learning process for military art to learning dancing or flute-playing from the basics, Polybius concludes:

> those who aspire to being generals regard it as a grievance if we demand of them a certain slight acquaintance with other pursuits. This would mean that those who practise banausic *technai* show greater diligence and love of honour than those whose aim it is to excel in the most beautiful and serious things – a proposition to which no intelligent man would give his assent.[130]

By Onasander's time, we are clearly told that

> we must choose a general, not because of noble birth as priests are chosen, nor because of wealth as the gymnasiarchs, but because he is temperate, self-restrained, vigilant, frugal, hardened to labour, alert, free from avarice, neither too young nor

[125] Polybius 1.84.6, 3.105.9, 5.75.2–6, 9.9.9–10, cf. 9.2.5, 10.47.12–13, 11.14.2, 12.28a.8–10, 16.20.3, 33.4. See also Diodorus 16.48.1; Onasander, *General* proemium 7–10, 10.20, 36.3–6; Plutarch, *Life of Demetrius* 19.3.

[126] See also Polybius 9.15.1, 10.43.1–2, 11.16.4, 27.20; Diodorus 13.78.1; Plutarch, *Life of Philopoimen* 15.2.

[127] As in Polybius 5.3.6, 5.4.6–13.

[128] Polybius 9.12–16, first quotation 14.1, second quotation 14.4–5, Loeb translation with modifications. A similar passage at 11.8.1–3. Cf. Bowen 2002.

[129] Polybius 9.20.1–3, cf. also 9.26as, 16.36.1.

[130] Polybius 9.20.5–9, Loeb translation with modifications. Cf. also 9.26a.11.

too old, indeed a father of children if possible, a ready speaker, and a man with a good reputation.[131]

Onasander argues that a man's income, which is ultimately a matter of *tyche*, should not affect the decision to choose him as a general or not. If anything, a rich general will be like an armour inlaid with gold or silver rather than bronze and iron (a reversal of the Platonic metal hierarchy?) – the latter may be less beautiful, but it is considerably more efficient.[132] Having argued that not only are wealth and nobility not a requirement, but that there are reasons to prefer people who are *not* rich and noble, Onasander goes on to say that the generals *can* use wealth or nobility as criteria when appointing the lower officers, who, being more numerous, are not necessarily judged on the basis of their character. In other words, we would have an army with talented, virtuous men of preferably humble origins at the top, giving orders to the scions of the noble and rich, in their turn leading the mass of the soldiers.[133]

Thus, over time the general appears to take on characteristics that, as we have seen in chapter 1, are associated with *techne*: the importance of *kairos*, the value of experience, and the problematic relationship with *tyche*.[134] In fact, in a few cases the general appears to take on the mantle of the technician, and specifically of the siege technology expert. Some bolt-heads have been found at Olinthus, besieged by Philip II of Macedonia in 349/8 BC, which are inscribed with his name. They could be projectiles for small non-torsion arrow-shooters. The inscription, in Marsden's opinion, suggests the existence of a 'department of mechanical engineering' established by that date, and also that Philip 'personally directed the engineers and detachments operating machines in action'. Inscribing the name of the king on the projectiles ('customizing') certainly denotes a high degree of identification with one's weapons, normally reserved for swords or shields.[135]

We have another example with Alexander the Great: according to Arrian, at the siege of Gaza in 332 BC there was disagreement between Alexander and his mechanicians, who thought that the mound of the city was too high to take by force. 'But Alexander thought that the more

[131] Onasander, *General* 1.1 (quotation, Loeb translation), 10, 21–5, 4.5, 33.1–6. Onasander compares the general to other professions: 1.1, 13–16, cf. also 4.5, 10.3, 23.1–3, 30.1, 32.10, 33.2, 42.6; cf. Plutarch, *Life of Philopoimen* 17.2.

[132] Onasander, *General* 1.19–20. [133] Onasander, *cit.* 2.1–5.

[134] Polybius saw *tyche* as one of the forces at play in war, e.g. 1.1.2, 1.4.1 and 5, 1.86.7, 2.7.1–3, 2.35.5–8, 4.2.4, 6.51, 57, 10.2.5–7, 13s, 15.15–16, 23.10.2, 29.21–2, 36.17.1. Diodorus tends to contrast *tyche* and *arete*: 16.1.6, 17.38.5, 17.105.6, 17.112.4, 116.4. Cf. Plutarch, *Comparison of Philopoimen and Flamininus* 2.1, *Life of Demetrius* 35.2.

[135] Marsden 1977: 213–16. The idea first occurred to Snodgrass.

impracticable it was, the more of a priority it was; for the deed would astound the enemies more, as it was beyond calculation (*paralogos*).' By out-calculating the experts, so to speak, Alexander proved right: in a technical *pièce de résistance*, the Macedonian mound was raised to reach the same height as the city mound, the machines that had been used to besiege Tyre arrived by sea, and, despite Alexander being (ironically?) wounded by a catapult, the Macedonians took the city.[136]

The most famous example of technician-warrior,[137] however, is Demetrius, the devoted son of Antigonus One-Eyed of Macedonia. 'Being exceedingly *eumechanos* and devising many things beyond the *techne* of the architects, he was called Poliorketes.' When in war, he would devote himself mind and body to the task, and 'in his time the greatest artillery was perfected and engines of all kinds, far surpassing those that had existed among others'. Most remarkable are Demetrius' swiftness in preparing things, the size of his engines, the number of the army, the might and *philotechnia* of the king himself.[138] His most famous siege was paradoxically an ultimately unresolved one: Rhodes in 305/4 BC, for which he deployed incredibly large stone-throwers and siege-towers.[139] While Demetrius' success as a general is described as due as much to his superior equipment as to his personal qualities (he was fearless), he was far from being morally perfect, and is presented by historians as a man in thrall to passions, *philotechnia* implicitly being one of them.[140]

An exhaustive assessment of Demetrius (with the benefit – or hindrance – of hindsight), is Plutarch's *Life* of him. Plutarch starts by saying that sometimes you have to expose the readers to bad examples of powerful men (namely, Demetrius and Marc Antony) for pedagogical purposes.[141] Indeed, the Besieger is here not quite an iconic figure: we are told that he was thought to be a better general in preparing than in deploying a force, and that he had something of the theatrical about him, including his dress style.[142] As for his technical side, Plutarch is ambiguous but ultimately damning. Demetrius, he says,

[136] Arrian, *Anabasis* 26.2–27, quotation 26.3, Loeb translation with modifications.
[137] Other technically minded leaders: king Antiochus Epiphanes in Polybius 26.1.1–14; the Roman consul Appius Claudius in Diodorus 20.36; Pyrrhus in Plutarch, *Life of Pyrrhus* 3.4–5. For a seventh-century BC Assyrian parallel see Dalley and Oleson 2003: 7.
[138] Diodorus 20.92.1–5, quotation 20.92.2, 5, Loeb translation with modifications, 20.103.3.
[139] Pimouguet-Pédarros 2003.
[140] Diodorus 20.45.6–7, 20.48, 20.85.1, 20.88.7, 20.49.4, 20.83.1, 20.85.3, 20.87.1, 20.87.4–88.1, 20.91.2–8; Plutarch, *Life of Demetrius* 21.1–2, 27.2.
[141] Plutarch, *cit.* 1.1–7, 11.1–2.
[142] Plutarch, *cit.* 20, 41.3–4, cf. Plutarch, *Life of Pyrrhus* 8.2–3, *Life of Philopoimen* 4.4–6.

when it came to ships and engines, never had enough of largeness, or of reflecting on them with pleasure. For he had a good nature and was reflective, and did not apply his love of *techne* to toys or useless amusements, like other kings [. . .] with Demetrius, even the *banauson* was kingly, and his method was a great one, since what he produced displayed sublimity of purpose and intelligence combined with extraordinariness and love of *techne*, so that men thought it worthy, not only of the mind and resources of a king, but also of his hand. For the size of what he produced terrified even his friends, and its beauty delighted even his enemies.[143]

But the love of display and excess which were part and parcel of Demetrius' 'technicality' were also essential elements in his downfall. As often in Plutarch, technology has a dark side: Demetrius himself is (ominously?) wounded by catapults at the sieges of Messene (297 BC) and Thebes (290 BC), and, for all his skill, he does not attain ultimate power, or ultimate respectability in the eyes of posterity.[144]

In sum, despite the persistence of voices that opposed the old way to the new, it can be said that the Hellenistic military revolution consisted at least in part of a change in mentality, attitude, or what we could call ethics – the military leader embraced characteristics usually associated with technical knowledge and expertise. Indeed, the military leader sometimes embraced the technical *ethos* itself, including its alleged moral ambiguity. To some extent, all this played in favour of the technicians involved with building catapults or designing fortifications, since the support and interest of the leader or king could enhance their importance and prestige. On the other hand, the rise of the technician-warrior led to marginalizations and elisions. For instance, in a poignant reversal of the emphasis on individual achievement we find in classical representations of war, the actual authors and builders of Demetrius' memorable machines are not reported by Diodorus, who almost implies that the (carefully described) design of the second *helepolis* is due to Demetrius himself. It is in fact Vitruvius – a technician – who reports the name of the architect behind it: Epimachus of Athens.[145]

CONCLUSION

It may have been true for some people some of the time that 'the prestige of warfare suffered as it became a matter of technical skills and no longer the

[143] Plutarch, *Life of Demetrius* 20, quotation 20.1–3, Loeb translation with modifications, 22.1–2, 24.1, 25.243.5. Cf. Xenophon, *Cyropaedia* 6.1.52–5.

[144] Plutarch, *Life of Demetrius* 33.2, 40.3, 42.5–6.

[145] Plutarch, *Life of Demetrius* 40.1; Vitruvius 10.16.4. For classical modes of elision, see Euripides, *Andromache* 693–705, quoted in van Wees 2004: 77; Beston 2000: 325–8; Chaniotis 2005: 35–6.

province of the citizen or the noble'.[146] Nonetheless, as well as the military leaders taking on characteristics associated with *techne*, there are indications that the professional soldier[147] and even the military technician absorbed virtues typically associated with the noble warrior.[148] For instance, despite the widespread diffidence towards mercenaries, they are occasionally described as possessing virtue and loving honour.[149] Honorific inscriptions that acknowledge contributions to military equipment, and therefore to the technical side of war, standardly use the language of goodwill (*eunoia*) and *philotimia*.[150]

The Hellenistic military revolution ushered in the rise of a new world leader, and it is thus fitting that the ultimate paradigm of the 'new' type of war and warrior, ambiguities included, was embodied by the Romans as described by Polybius. He concluded the narration of the first Punic War thus: 'the progress of the Romans was not due to chance, as some of the Greeks think, and was not involuntary, but [. . .] by training in such vast and perilous enterprises it was perfectly natural that they not only gained the courage to aim at hegemony, but executed their purpose'.[151] A prime example of the Romans acquiring expertise is the report of how in the course of the first Punic War they turned themselves into a military navy, starting, according to Polybius, from absolutely nothing. The key word here is *apeiria*, which was remedied by capturing and then copying a Carthaginian ship, and by training oarsmen on land first.[152] Indeed, the Romans are presented as characteristically good at changing habits and emulate what is best from other peoples. That is part both of their success, and of their self-image.[153]

Interestingly, there is linguistic and archaeological evidence that the Romans were far from being completely land-bound before the first Punic War. They may not have been a naval super-power, but they were not as inexperienced as Polybius makes them out to be. At least to some

[146] Hunt 1998: 185. [147] Couvenhes 2004: 79.

[148] I do not want to overstate this claim: a certain ambivalence towards the cross-contamination of soldier and expert, war and technology remains, see Xenophon, *Cyropaedia* 1.6.43, 2.3.11; Polybius 6.52–4, 9.23.4–5, 16.30.1–3.

[149] Diodorus 16.12.3, 17.3, 20.62.4.

[150] Dittenberger 1915: 329 = *IG* II^2.554, 502 = *IG* 12.8.156, 569 = Maier 1959: 46; Maier 1959: 177; Hallof, Hallof, Habicht 1998: 116–21. Numerous other examples in Maier 1959. See also Whitehead 1983; van Wees 2004: 22–6, 32–3.

[151] Polybius 1.63.9, Loeb translation with modifications, cf. 5.88.3, 18.28.4–5.

[152] Polybius 1.20.8–21.3, cf. 1.81.10–11, 3.48.10–11, 5.2.4, 5.39.6, 7.8.1, 23.5.4, 23.7.5, 23.13.1, 28.21.4–5; Diodorus 13.40.1–2. See also Xenophon, *Cyropaedia* 4.3.10, *Memorabilia* 3.1.6.

[153] Polybius 6.25.11; Diodorus 23.2.1 (fragments); Onasander, *General* proemium 1, 5–6, 21.4, 32.1, 32.9–10.

extent then, this was a deliberate construction of the image of the Romans on the part of Polybius, precisely to offer a paradigm of a certain type of warrior and general.[154] Take also the Hellenistic historian's famous description of the differences between Greek and Roman encampments: 'the Greeks in encamping think it of primary importance to adapt the camp to the natural advantages of the ground, first because they shirk the labour of entrenching, and next because they think hand-made defences are not equal in value to the fortifications which nature provides unaided on the spot'. The Romans, on the other hand, have a geometrically regular, standardized lay-out that allows them to know where they are, feel at home wherever they are, and effectively control and dominate the territory rather than be controlled by it.[155] Once again, some of the motifs emerging from our discussion in chapter 1 are in evidence here: the 'natural' state of the terrain is in thrall to chance – it may offer advantages or not. By taking it as it comes, the Greeks choose to embrace fortune, as it were, adapting to it rather than modifying it or creating their own environment. The Romans, on the other hand, even if it may mean refusing the possible aid of nature, and at the cost of greater effort, guarantee stability and regularity by taming chance in a man-made environment.[156]

And again, for any technician-warrior there may be a specular image. If with the Romans Polybius is indeed depicting a sort of technicization of the military leader, which we have also seen embodied in Demetrius Poliorketes, perhaps the conclusion of book 10 and thus of the whole of Vitruvius' *Architecture* exhibits the parallel but contrary process – the militarization of the technician. Vitruvius concludes his description of catapults and siege engines (which bears a striking resemblance to Athenaeus'), with some morality tales. Principally, we are told the story of a double technical failure. The engineer Kallias proposed an anti-*helepolis* device to the people of Rhodes, who liked it so much that they proceeded to dismiss their usual resident expert, Diognetus, and employed Kallias instead. But the giant tower devised for Demetrius Poliorketes (then besieging Rhodes) by yet another technician, Epimachus, proved more than a match for Kallias' engine. The Rhodians were then forced to call back Diognetus, who destroyed the machine, but – please note, with a

[154] Janni 1996: ch. 10.

[155] Polybius, 6.27–32, 41–2 (quotation at 42, Loeb translation with modifications). N.B. book 6 of Polybius' *Histories* is only known through fragments, some of which are summaries. Cf. also Polybius 18.18; Garlan 1975: 112–13.

[156] A similar issue emerges – but reversed – when Polybius discusses the Macedonian phalanx and compares it to the Roman way of fighting at 18.31–2.

trick, rather than another machine. The technical failures in this story are many and interlocked: Kallias' device which in his intentions should capture Demetrius' *helepolis* fails before even the first attempt; Epimachus' *helepolis* which in his (and Demetrius') intentions should bring Rhodes to its knees also fails to do so; the real winner of the story, Diognetus, outwits, rather than out-machines, the competition.[157] In the implicit hierarchy which is thus eventually established among the ranks of the technicians, Diognetus, rightly reinstated in the favour of the Rhodians, is at the top, because he is superior *both* in technical *and* in tactical knowledge. He is superior even to the strategic minds involved in the story: Demetrius on the one hand (put down by Vitruvius' snide remark 'called Poliorketes because of his obstinacy of spirit') and the Rhodians on the other (unable to recognize true worth and fickle in assigning honours, if redeemed in the end).

Vitruvius concludes with a warning: 'thus these victorious cities were freed not by machines but by the intelligence of the architects *against* the functioning of machines'.[158] Perhaps by the late first century BC, and on the threshold of the Roman Empire, the military and technical revolutions had come full circle. The introduction of the catapult was not so much the end of manly virtue, as possibly the redefinition of the virtues necessary to be a man: not only had the *strategos* become a technician, but the technician could now lay claim to the role of *strategos*.

[157] Vitruvius 10.16.3–8, 10.16.9–12.

[158] Vitruvius 10.16.12, italics mine.

CHAPTER 3

Death and the craftsman

So far, it would seem that our picture of ancient technology can change depending on whose voice we choose to listen to, and in particular what group of sources we decide to consider a part of our story. Both chapters 1 and 2 have arguably showed that representations of technology were and are contested. At the same time, understanding such representations in their complexity is an integral part of our understanding of wider phenomena such as political and social life in classical Athens and the Hellenistic military revolution. I have also argued that, in the face of the marginalization or elision of technicians and their activities on the part of ancient, as well as modern, observers, the available textual sources produced by technicians depict them and their activities in a positive light, as being proud of what they do and aware of its importance for society and for the state.

As we move through time to reach the Roman Empire, these initial impressions appear to be confirmed. Vitruvius depicted architects as thoroughly educated consolidators of Augustan rule,[1] Hero of Alexandria insisted that military engineering was much better than philosophy at achieving tranquillity of mind,[2] and Galen wrote: 'The crucial difference between [so-called "dumb" animals] and man [. . .] is seen in the great variety of *technai* which this latter animal performs, and from the fact that man alone has the capacity for knowledge: he can learn whichever *techne* he wishes.'[3]

And yet, one could object that Vitruvius, Hero and Galen were not necessarily representative of the majority of technicians. They were rich, well educated, well connected, the successful social climbers, the ones who made it. What about the 'invisible technicians'[4] who healed, built engines,

[1] See Romano 1987. [2] Hero, *Construction of Artillery* 71–73.11.
[3] Galen, *An Exhortation to Study the Arts* 1.2, tr. Singer, slightly modified.
[4] The phrase is from Shapin 1989.

designed fortification towers, but whose names and voices have not been registered in our written record? Are they lost to history for ever? This chapter will be an attempt to answer that question in the negative, and, by so doing, address the more general issue of how ancient technicians viewed themselves. It will also, I hope, provide an example of how non-textual sources can be used in the history of ancient technology, a field which, I feel, has been hampered by its overemphasis on textual sources.

Writing a history of 'low' technicians runs up against similar obstacles to those encountered when trying to recover information about women, children or slaves in Greek and Roman antiquity. The last twenty years of scholarship have shown that, compared to textual sources, material evidence can provide us with a more direct, if no less complex, channel of access to these groups. Particularly fruitful are funerary monuments: tombstones, urns, sarcophagi.[5] The way women, children or slaves were represented in death has taught us a lot about their lives. I shall try to do the same with technicians: given that extant texts express the viewpoint of only a particular section of technical practitioners, I will analyse material remains, especially those linked to commemoration of death, in an effort to reconstruct the wider group.

Luckily for me, there is a vast number of representations of technicians, their activities and their instruments in Greek and Roman art, and a good portion of the Roman evidence, mostly from Italy and dating from the first two centuries AD, has been conveniently collected by Gerhard Zimmer.[6] Zimmer organizes his evidence by professional category: bakers, smiths, and so on. I have chosen instead to focus on the iconography of one particular instrument: the carpenter's square (*libella* in Latin, *diabetes* in Greek – the main object on the front cover of this book). This because I realized that even the interpretation of individual technical motifs is still at an embryonic stage, and it may be a good idea, before we attempt to read entire sentences, so to speak, fully to understand the individual words of which they are composed.

PRELIMINARY QUESTIONS

Before starting my analysis of the material, I will discuss three methodological problems: what was the purpose of representations of technicians in

[5] For reasons of space, I will not focus on funerary epigraphy, but see Geist 1969: 74–83; Joshel 1992; Donderer 1996; van Nijf 1997.

[6] Zimmer 1982. I shall rely extensively on his work for identification and *prima facie* interpretation. See also the remarks in Feraudi-Gruénais 2001 and Clarke 2003, esp. ch. 4.

funerary art? Can the funerary monuments of technicians be taken to reflect their own views? And, should these images be taken to represent the real world of the technician, or an ideal?

The first question is part of the much larger issue of the purpose of funerary art in the Roman Empire. The consensus of scholars is that, generally speaking, tombstones, monumental graves and the like were a strong expression of the identity and status of the dead person and his or her family. Members of the higher orders, including the imperial family, used funerary art to reaffirm and advertise their prestige and power; through it members of the lower orders channelled their aspirations to upward mobility, or celebrated their actual rise in status, acquired wealth, and often hard-earned freedom.[7] For instance, tomb reliefs of freedmen or -women often emphasize child–parent or wife–husband relationships, this latter in the form of *dextrarum iunctio* (joining of the right hands); modesty for women and dignity for men are signalled by their dress, be it the toga or a veiled head. This has been linked to the fact that having a legally recognized family and upholding the traditional virtues of the Roman citizen marked and celebrated acquired freedom. Again, many people who had gained status or citizenship through the army were pictured bedecked with military paraphernalia. In general, 'in reflecting the world of public life, and in representing its subjects' involvement in that world, art proved a fundamental means for identifying, constructing, and negotiating individuals' places in the hierarchy of Roman society'.[8]

This kind of historical analysis has become more and more fine-grained. It has been pointed out that different places and different periods saw different modes of change, of continuity and revival in funerary practices (for instance, inhumation v. cremation) and styles (ostentatious display v. restraint).[9] Some changes in the quantity and quality of the evidence have been linked to the increased prominence of certain groups within society. The explosion in quantity and quality of highly visible tombs of freedmen and -women through the first and second centuries AD has been linked to the presence, also recorded by contemporary literary sources, of rich, powerful and increasingly vocal *liberti*.[10]

Paul Zanker has also charted a change in modes of self-representation in the course of the first and second centuries AD, when images of lower and

[7] See e.g. Zanker 1975, 1992, 1993; Meyer 1990; Joshel 1992; van Nijf 1997: 31–8 with further references; Mouritsen 2005.
[8] Elsner 1998: 39. [9] See e.g. Toynbee 1971; I. Morris 1992.
[10] Zanker 1975; Zimmer 1982; Meyer 1990.

'middle class' citizens waned, while identification through one's profession became more frequent. This was due in his view to decreased access to the political arena, and was paralleled by a move in funerary architecture from visible tombs lining the sides of the road just outside the city limits, to enclosure tombs which were only accessible to relatives or work colleagues.[11]

Zanker's study underlines the fact that several choices of representation were available to a person or family planning to leave a memorial. Often the deceased was in effect transfigured after death: there are numerous examples of humble citizens who transcended their actual status, and are depicted on their graves as philosophers, mythological heroes or even divinities.[12] In those cases, art proved a fundamental means for constructing a place for the individual which was infinitely better than any they might have occupied in their lifetime in Roman society; it provided a celebration, exaltation and perhaps belated recognition of the worth of the deceased and, by association, his or her family.

This has important consequences for the issue at hand. If anyone could in principle be consecrated in stone into a Hercules or a Venus, or at least an elegant lady of leisure or a gentleman reclining at a banquet, why didn't everybody choose to be so represented? If there was a strong bias in antiquity against technical activities (as the 'mainstream view' outlined in our introduction maintains),[13] why do we find funerary representations of smiths, tanners, cloth-makers at all? Especially if we subscribe to another widely shared view, namely that the artistic taste of the lower classes was heavily influenced by that of the upper classes? The fact remains to be explained, then, that at least some technicians chose to be identified and remembered through their activities, rather than in other ways.

Some historians have suggested that the representation of labour was a plea for reward in the afterlife: having toiled in this world, the deceased expected a better life beyond it.[14] Most scholars, however, see the depiction of work scenes or instruments as a sign of pride in one's activities, and of the desire to acknowledge what may have been one's primary source of wealth, status or even (in the case of slaves who bought themselves out) freedom.[15] At the same time, many have denied this type of funerary art a more specifically political dimension, and work scenes have almost been

[11] Zanker 1992: 352; cf. also Eck 1987: 76–7; van Nijf 1997: 5.
[12] Wrede 1981; D'Ambra 1988, 1989; Zanker 1995b. [13] Kampen 1981: 25.
[14] Prieur 1986: 126. In support Zimmer 1982: no. 136.
[15] Burford 1972; Reddé 1978; D'Ambra 1988; Joshel 1992: 5–7; Elsner 1998: 92; Clarke 2003: 111, 117–18.

characterized as a flight from politics towards the comforts of an audience restricted to one's family and at most professional peers: 'one finds no symbolic layers, no specifically religious or political content'.[16]

Whether or not representations of technicians in funerary art had a political, as well as social and cultural, function, will be discussed in the conclusion. For now, a second question presents itself.

If they are an expression of pride, can the funerary monuments of technicians be taken to reflect their own views? In many cases, we can answer in the positive.[17] Access to self-expression through funerary art was of course open to only a fraction of the population: those who could afford it, and who had enough authority in their familial group to make choices about the way members of the family were publicly represented. That left out the poor, children and many women. Yet, even with all these qualifications, significantly more people, and from a wider section of society, were able to access the medium of funerary art than that of, say, literature. At least in some cases, testamentary dispositions, even detailed ones, were left stating one's choice of funerary representation,[18] and it is plausible that the person in charge of the burial would have tried to meet the wishes, actual or guessed, of the deceased (especially when this latter was a male adult) even when no detailed dispositions existed. The most straightforward scenario is when the person had the monument or grave made while they were still alive.[19] This was indicated by such formulas as *sibi fecit*, *se vivo/a* or *vivus/a*. The data collected by Saller and Shaw[20] reveal that, for instance, in the city of Rome throughout the imperial period free citizens belonging to the lower orders were rather more likely to take care of their own funerary commemoration than equestrians and definitely more likely than senators. Throughout the empire the likelihood that people would make provisions for their own grave does not seem to have been strictly correlated to status, and varies widely from region to region: for instance, it was quite high among imperial slaves in the city of Rome, but practically zero for imperial slaves at Carthage. As for this chapter's sample, a good portion of the tombs examined were explicitly set up following the dead person's wishes.[21] Thus, while the evidence does not allow strong claims, and more research is needed on this aspect, it would seem that, in parallel to

[16] Kampen 1981: 63; Pannoux 1985: 303; Zanker 1992.
[17] See Zanker 1975; Kampen 1981; Joshel 1992: 19; Elsner 1998: 92–3.
[18] The *locus classicus* for this is Petronius, *Satyricon* 71–2.
[19] Kleiner 1977; Eck 1987. [20] Saller and Shaw 1984: appendix.
[21] This compares well with Zimmer 1982: more than a third of his examples explicitly indicate that the person provided for the burial while still alive.

the high significance of funerary self-representation for members of the lower orders and for upwardly mobile elements of society, those groups were also more likely personally to ensure that they would be remembered by posterity, rather than leaving it to family, associates, or the state itself, as was primarily the case, for instance, for senators.

The degree of actual intervention on the funerary monument was a function of financial resources, and of the desire to spend them. It is well known from the case of sarcophagi that some funerary art was mass produced. Standard sarcophagi were carved with scenes appealing to general taste; the inscription and portrait of the deceased would later be made to specification. Given that work scenes do not seem to have figured among standard mass-produced decorations,[22] their presence often indicated a strong degree of positive decision, and sometimes a willingness to spend more money in order to express oneself in a particular way. Not all tombs in our sample were rich – some of them are products of inferior quality.[23] On the other hand, some are quite expensive, and for several of them the instruments appear to have been rendered with accuracy and care.

Given, then, that work scenes or tools were often the direct expression of the technician's self-image, should they be taken to represent the real world or an ideal? Once again, this is part of a much larger question: the relationship between art and reality, especially in cases where one of the main purposes of art was the construction and reinforcement of public identity.

As we have already said, funerary representations were often idealized rather than realistic, and realistic funerary representations have too often been taken as unproblematic. With an approach similar to the one traditionally held towards ancient technical texts, the artistic renditions of *techne* or *ars* have generally been seen as down-to-earth, straightforward snapshots of everyday life.[24] More recently, different trends both in the history of science and in the history of art have led to a re-evaluation of technical texts on the one hand and representations of technical objects on the other. The presence in this type of evidence of rhetorical strategies and multiple levels of meaning has been recognized, as has its symbolic significance.[25] In other words, we can look at depictions of work scenes and tools in funerary art and argue that they could both reflect reality *and* convey some symbolic meaning. In this sense, work imagery is not different from other kinds of imagery common in Roman funerary art: military

[22] Susini 1960: in some cases work tools may be a sort of workshop signature; Amedick 1991: 117.
[23] Koortbojian 1995: 14 with further references.
[24] Bianchi Bandinelli 1967. [25] Elsner 1998: 92.

insignia or symbols of office worked in the same way.[26] Many freedmen who reached the rank of *sevir Augustalis*, i.e. became members of a municipal organization which seems to have been in charge of the imperial cult, advertised it by having its *insignia*, the *fasces* and the *sella curulis* (a folding stool upon which senior magistrates were entitled to sit), engraved on their tombstones. In at least one case, these symbols of civic respectability are juxtaposed with those of the profession of the deceased: the funerary stele of the freedman Lucius Aebutius Faustus has a relief with a dismantled surveyor's *groma*, and a *sella curulis* and *fasces* just above it, albeit on a slightly smaller scale.[27] Is the arrangement of the two sets of objects an indication of their respective value for the deceased? And are the *membra disiecta* of the technical instrument itself a symbol of mortality?

In parallel to emblems of participation in public life for men, we often find weaving or spinning tools engraved on the tombs of women,[28] together with frequent references in women's epitaphs to the fact that the deceased was utterly devoted to those feminine tasks. It has been argued that these representations may hint less at an actual main activity (clothes in the Roman Empire were often produced outside the household) than at a traditional role, that of the virtuous, retreating matron. In at least one case, a wool basket makes a startling accessory for a woman who is naked and reclining on a couch in a Venus-like pose, seamlessly combining the qualities of home-bound femininity and unabashed beauty and grace.[29] Yet another example of the polysemantic role of funerary images is religious symbolism.[30] Not only did emblems of Christianity, Judaism, Mithraism and other religions and cults indicate the affiliation of the deceased, but they offered interpretations of the meaning of life (the dove as peace, the fish as rebirth) and protection for the dead in their journey through the underworld.

In sum, given the (as we argued) pretty high level of intentionality and the close link between art and identity, the depiction of work scenes and technical instruments should not be taken as simply a snapshot of the life of the deceased. These images point at actual activities while carrying other meanings; they are symbols as well as descriptions. But let us turn to our

[26] Franzoni 1987; Schäfer 1989; Devijver and van Wonterghem 1990: 74; Hope 2000; Clarke 2003: 272–5.

[27] Zimmer 1982: no. 141; Schäfer 1989: 342n. 721. A possibly related example in Schäfer 1989: 396–7, table 100.6. Zimmer 1982: 61–2, has examples of funerary representations where the emblems of office dominate over tools of the trade, and examples where they are presented as roughly equivalent.

[28] D'Ambra 1993.

[29] The tomb of Ulpia Epigone, see D'Ambra 1989, also D'Ambra 1998: fig. 109.

[30] Cumont 1942.

specific example; we will further explore the symbolism of technical instruments in the third part of this chapter.

THE ICONOGRAPHY OF THE CARPENTER'S SQUARE

The carpenter's square is one of the oldest technical instruments to have been used in the Mediterranean area. Along with other tools, it was found in the tomb of the Egyptian architect Sennedjem, dating to the twentieth dynasty (between 1340 and 1084 BC).[31] The *libella* (as I shall henceforth call it for brevity) when used with a plumbline enabled the person using it to draw straight lines and perpendiculars. Moreover, because a *libella* in fact incorporates a square (*norma*), which in its turn incorporates a short measuring rod (*regula*), it might also have been used to measure lengths and check if a line was level. Thus, the *libella* was useful as an instrument in building on all scales, from carpentry to architecture to engineering, and in surveying.[32] While some of its applications must have been straightforward, a certain expertise would have been required to use it for the solution of the so-called 'mechanical' problems, such as for instance the duplication of the cube. In sum, the *libella* was a versatile instrument: it could perform both simple and complex tasks, and its use involved degrees of skill ranging from a modicum of technical experience all the way to a superior level of craftsmanship.

I have come across around twenty images of *libellae*, mostly datable to the first and early second centuries AD. They are predominantly from Italy or the city of Rome itself, with several examples from Gallia Narbonensis (Southern France) and one from Germany.[33] This may reflect the present state of scholarship and of data-collecting rather than the actual archaeological record.[34] There does not seem to be any explicit correlation between one's status and having a *libella* on one's grave; the *libella* is generally accompanied by other tools, and its position in the visual economy of each piece varies from being in the main body to being at the very bottom. Quality and costliness of the items vary, as does their typology, although the majority are funerary stelai. Most items with a *libella* have no portrait or other 'organic' element, by which I mean, containing representations of

[31] Cairo 1980: no. 2005; also a frequent shape for small Egyptian amulets: Deonna 1932: 465.
[32] Lewis 2001.
[33] I have not taken into account items whose description is not satisfactory because they are no longer extant or too fragmentary: Armellini 1880: 219–20; Hettner 1893: no. 194; Espérandieu 1907: I 225, I 501, I 510, I 730, I 781, VII 5498; Lugli 1957: II, table 25.5; Zimmer 1982: nos. 93, 108, 109, 110, 170.
[34] Reddé 1978: 47.

living beings *qua* living beings (e.g. symbolic animals do not count). I will describe some of the pieces first, to give the reader an idea of the material under examination.

The first example is a funerary stele now in Reggio Emilia. According to the inscription, it was set up by the freedwoman Pettia Ge for herself, her *patronus*, himself a freedman, another freedman who is described as a *marmorarius*, and two more freedwomen, whose names (and remains) may have been added to the inscription and to the burial at a later stage. The stele has a full-figure portrait of a man and a woman holding hands in a gesture known as *dextrarum iunctio* and denoting marriage – whether Pettia's husband is her *patronus* or the sculptor is disputed.[35] In higher relief at the bottom, sharing the same space as the last words of the inscription, are two hammers, a plumbline, a square and a *libella*.[36]

The second example is a funerary relief from Verona, for which no inscription is extant.[37] It depicts a *sella curulis*, heavily decorated with objects typical of the *seviri Augustales*' ritual and flanked by two men bearing *fasces*; under the chair we see a rabbit or hare on top of a box engraved with a seahorse, in its turn resting on a pediment or altar on which are engraved a *libella*, a see-saw, a square, compasses, and a small axe.

Finally, a sarcophagus found near Arles, with an epitaph which reads:

> Tomb of Quintus Candidus Benignus, master builder of the Arles association. He had the full extent of the building art, dedication, knowledge and discretion; great technicians on any occasion declared him head of the association; nobody was more knowledgeable than that; nobody could defeat him; he knew how to make instruments and direct the flow of waters, he was a cherished guest here; he knew how to nurture friends with ingenuity and dedication, mild and good-natured, Candidia Quintina for her sweetest father and Valeria Maximina for her dearest husband.

The text is flanked by *D*(*is*) and *M*(*anibus*) (to the gods of the afterlife) and above them, in small-scale relief, by an axe and a *libella*.[38]

[35] See Zimmer 1982: 167.

[36] Zimmer 1982: no. 91: found in Reggio Emilia, dated by Zimmer to the first quarter of the first century AD on grounds of typology and hairstyle; Pflug 1989: 177, fig. 13.1, dates it to the first century BC.

[37] Mansuelli 1964: I table 103.208, II 224.340; Zimmer 1982: no. 86: found locally, first century AD.

[38] The description in *CIL* 12.722 (published in 1888): '*Q Candidi Benigni fab tig corp Ar ars cui summa fuit fabricae studium doctrin pudorque quem magni artifices semper dixsere magistrum doctior hoc nemo fuit potuit quem vincere nemo organa qui nosset facere aquarum aut ducere cursum hic covviva fuit dulcis nosset qui pascere amicos ingenio studio docilis animoque benignus Candidia Quintina patri dulcissimo et Val Maxsimina coniugi kar.*' See Brunt 1980: 87, on *fabri tignarii*, with some references; Gaggadis-Robin 2005 and below note 54.

Each of these three pieces is representative of different degrees of realism. The funerary stele of the Pettii and others like it – the stele of the Aebutii (also *liberti*),[39] the funerary altar of the Cossutii,[40] that of the Statii,[41] a pillar-shaped tomb from Augsburg,[42] the stele of the soldier and architect Q. Valerius Seius,[43] and two stelai now in Altino near Venice (one concerns a freedwoman)[44] seem to lend themselves to straightforward interpretation. They depict instruments because those instruments were typical of the profession of the deceased or of the person in charge of the burial. The *libella* is always accompanied by tools, including writing implements, such as could have been found in the workshop of a sculptor, a carpenter, a builder or a surveyor.

The arrangement of the instruments with respect to each other and to the rest of the monument should also be noted: in our 'realist' examples they are indifferently in the tympanum, the bottom, or the sides, and are laid out in no obvious order, with the partial exception of the Aebutii stele, where the plumbline bisects the top corner of the tympanum, and especially of the Pettii stele, where, as you can see in fig. 3.1, the two hammers are symmetrically flanking the plumbline, which again vertically divides the space into two, with *libella* and square facing each other. One would be hard pressed to read into these pieces of material evidence anything more than reference to a profession, and perhaps pride in its practice. Symmetrical arrangements, however, insinuate the idea that the objects were not bare 'indexes' of the technician's activities, but essential elements in the way the whole monument was to be viewed.

[39] Zimmer 1982: no. 105: now in Rome, original site unknown, end of the first century BC. The tympanum has a ruler with two kinds of subdivisions, a *libella* with plumbline, a square, a plumbline, and straight compasses.

[40] Zimmer 1982: no. 92: Rome, first or early second century AD. One side of the altar has a *libella*, a ruler, a square, a hammer, curved and straight compasses, and a chisel. Rawson 1975: the Cossutii included architects over more than one generation; Donderer 1996: 58.

[41] Zimmer 1982: no. 95: Aquileia, first half of the first century AD. The middle has a ruler, square, *libella*, straight compasses, plumbline, hammer and a bundle of styli.

[42] Kellner 1971: fig. 128; Wagner 1973: no. 29: probably second half of the second century AD, the tomb has a graffito of *libella*, axe and carpenter's plane at the very bottom of the pediment. The inscription specifies that it was set up by T. Flavius Martialis for himself and his parents while all still alive, and for his dead brother, who was a soldier.

[43] Swoboda 1958: 41, table 4.2: near Vienna (Carnuntum), late first century AD, it has at the bottom a graffito-like relief of a *libella* and straight compasses.

[44] For the first, see Zimmer 1982: no. 106 (no picture); Pflug 1989: 225–6, fig. 26.4: first quarter of the first century AD, no inscription, busts of two women, perhaps wife and daughter, and a man, at the bottom a relief of a plumbline, laid horizontally, a ruler and a *libella*. For the second, see Zimmer 1982: no. 106a: a stele pediment, second half of the first century AD, on its sides a *libella* with plumbline, and straight compasses and a ruler, respectively. The inscription commemorates a Q. Sicinius Quinctellus, who took care of the stele, and his wife, a freedwoman.

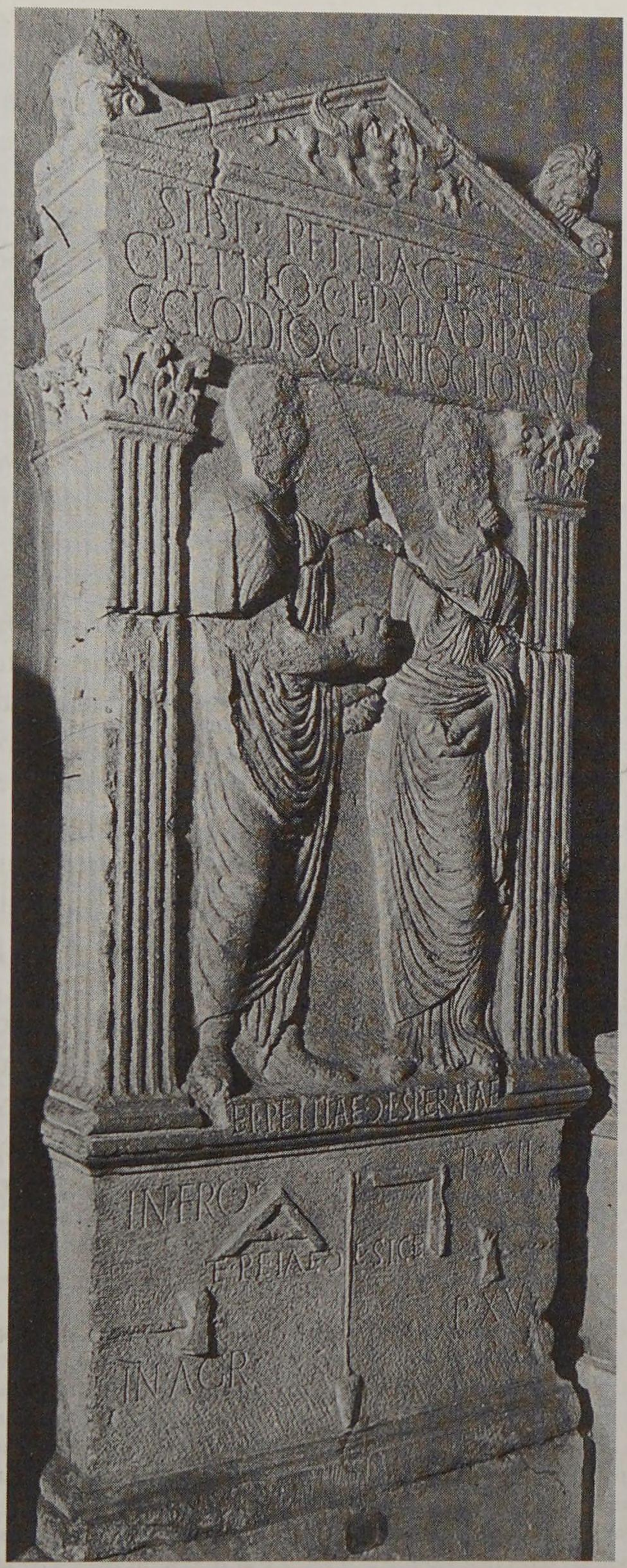

Figure 3.1 The Pettii stele: from G. Zimmer, *Römische Berufsdarstellungen*, Berlin: Mann 1982, p. 168, fig. 91, photograph copyright Carl Schütte and C. Behling, Berlin, Germany.

Indeed, far from lending themselves to straightforward readings, some depictions of *libella* cast doubt on the possibility itself of simple interpretations. For instance, the funerary stele of L. Magius Primio, his wife and daughter, with a relief of two chisels and a hammer symmetrically flanking a rather large-scale *libella* resting on a base, has been seen by Zimmer as an 'emblematic graphic representation with symmetrical distribution of the objects against the surface'.[45] The emblematic character of tools, and of the *libella* in particular, can also be detected in a funerary stele from Bologna, whose most prominent visual elements are a Medusa head in the tympanum, flanked by rosettes, and a *libella* with plumbline plus a pair of straight compasses at the bottom. The mythological and technical motif which dominate the picture mirror each other, the triangle of the *libella* an echo of the shape of the tympanum. Such attention to symmetry makes the tool more than just an indicator of a profession perhaps shared by the three men mentioned in the inscription (were they all builders?).[46]

The superposition of objects and levels of meaning is at its most complex in the funerary relief from Verona in fig. 3.2. While there is no inscription, it seems evident that the deceased was a *sevir Augustalis* and possibly a carpenter, so the instruments are *prima facie* a simple pointer to his profession and to his membership of the order. Yet, the use of objects in the relief is far from simple. The two apparently organic elements, the *fasces*-bearers, are in fact themselves objectified: rather than real people, they are emblems of the affiliation and consequently, of the respectable freedman's status of the deceased. On the other hand, their pose, flanking the main panoply of objects but also looking at it, directs, and identifies with, the observer's gaze. The whole constellation of things that define the life and the career of the deceased is layered: we have a picture of objects bearing pictures of other objects; its multiplicity of levels inviting a multiplicity of semantic levels as well.[47] The hare on top of the seahorse (the picture of a real hare on top of the picture of a seahorse) connects the two worlds of labour and civic duties. Both the hare and the seahorse can be

[45] Zimmer 1982: no. 97: Brescia, mid-first to second century AD. Magius Primio set it up *se vivo*.

[46] Susini 1960: 117 ff. no. 131, table II; Zimmer 1982: no. 103: second half of the first century AD. It was set up by L. Statorius Trophimus, a *sevir*, and his wife for L. Statorius Bathyllus, his patron, also a *sevir*, and for his friend P. Messius Calvio. See also Zimmer 1982: no. 85: found in L'Aquila, late first or early second century AD, probably tympanum of a funerary monument, it has a *libella* with plumbline occupying the central position, hovering above a smaller-scale carpenter's plane and what looks like the head of an axe.

[47] Two more examples of self-referential technical tombs are the funerary stele of the Longidieni: Zimmer 1982: no. 62, (cf. Pflug 1989: 152–3, fig. 2.1–2; Mansuelli 1967: 127) and the tomb of the Haterii: Zimmer 1982: no. 83.

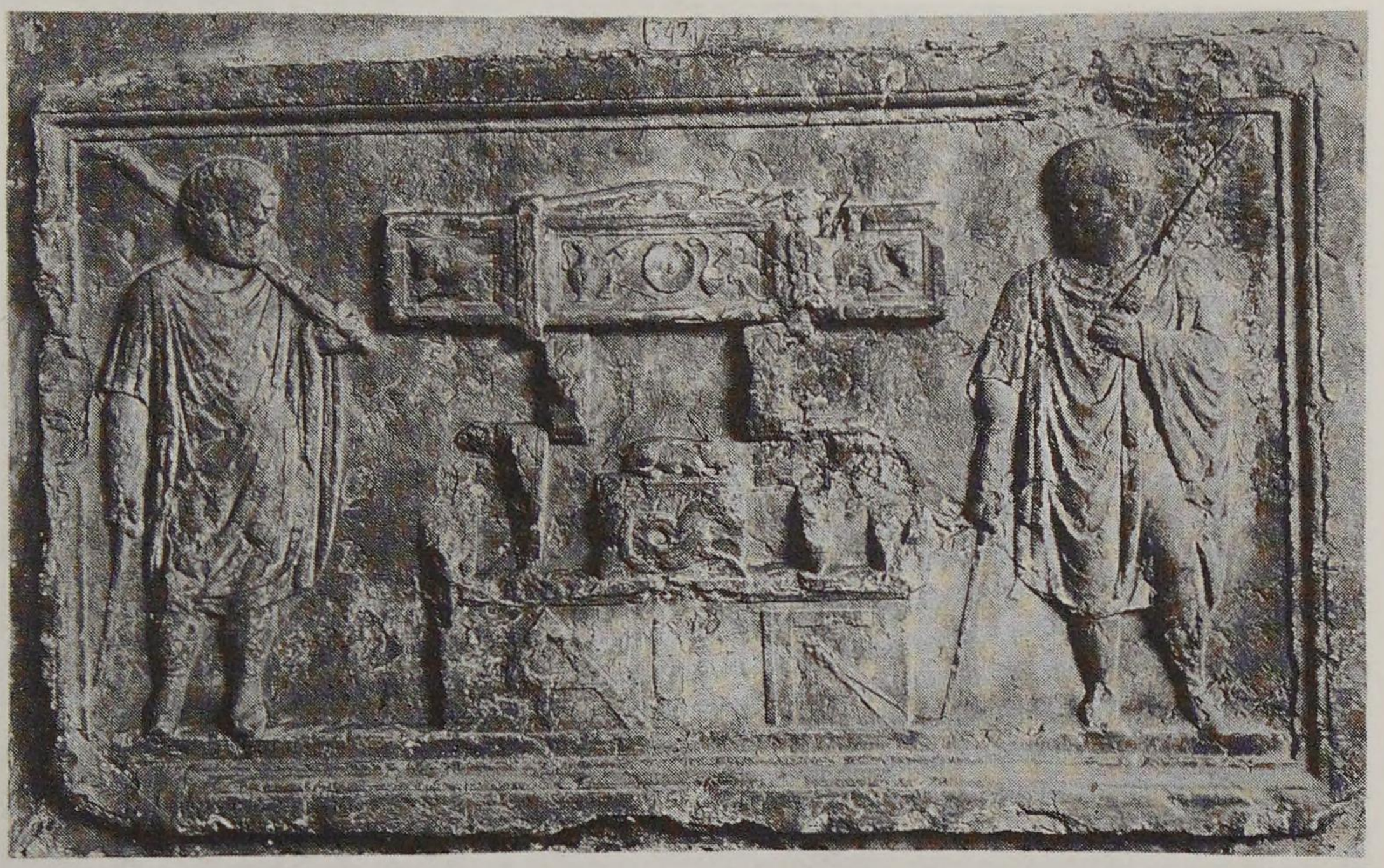

Figure 3.2 The Verona relief: from G. Zimmer, *Römische Berufsdarstellungen*, Berlin: Mann 1982, p. 164, fig. 86, photograph copyright Carl Schütte and C. Behling, Berlin, Germany.

seen as auspicious funerary symbols, the former perhaps representing fertility, the latter immortality.[48] As for the tools, they appear subordinated to the *insignia* of the *seviri* order, placed as they are in an inferior position. They are at the base, however, possibly also in a metaphorical, and slightly different, sense: the deceased started from his profession, perhaps purchased his freedom thanks to the profit from his work, and rose to a new order of objects and emblems, the ritual and religious world of the *seviri*.

Again, a house- or temple-shaped sarcophagus from Rome bears a relief of technical instruments (*libella*, ruler, straight compasses, chisel and a hammer) in the tympanum on one of the shorter sides.

Because of the tools, this object has been seen as the burial of an architect or a builder, an interpretation that makes perfect sense but does not exclude other meanings.[49] In fact, especially if the deceased *was* a builder, the sarcophagus is revealed as a multi-semantic object: it represents both

[48] Cumont 1942; Mansuelli 1964: II 225; Toynbee 1973.

[49] Gütschow 1938: 101–12, tables 21–2; Zimmer 1982: no. 96, 171: Rome, found in the catacombs of Praetextatus, perhaps end of the third century AD. Gütschow 1938: 108: at least two other fragments of funerary monuments from the same site bearing images of work tools, in one case of a *libella*. I thank Glynis Davies for the suggestion that this is a temple rather than a house.

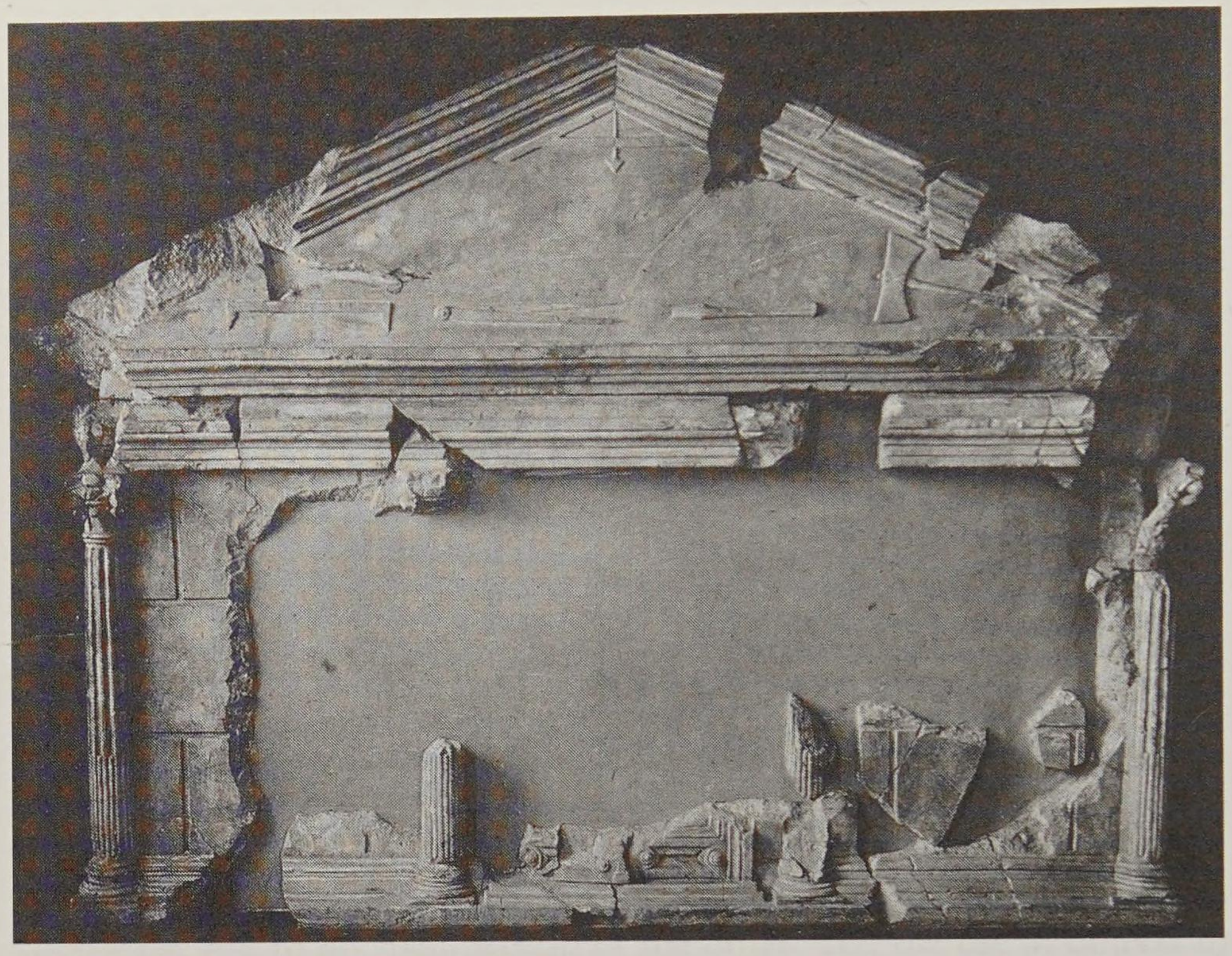

Figure 3.3 The 'house-shaped' sarcophagus: from G. Zimmer, *Römische Berufsdarstellungen*, Berlin: Mann 1982, p. 171, fig. 96, photograph copyright Carl Schütte and C. Behling, Berlin, Germany.

what the person himself made, and the means through which he, or his family, were able to provide him with such a lavish burial.[50] It also stands for the deceased, is an emblem of his public identity, as are the building tools: they have helped make the edifice on whose side they now stand as decorations. The sarcophagus, with its tiled roof, columns and a door slightly ajar,[51] is itself a symbol of the afterlife, the new space whose door the deceased will have to go through, the enclosure which will now separate him from the world of the living.

Sometimes, the information from visual and epigraphic elements seems to clash. Thus, a funerary stele set up by the wife and son of Q. Appeus Augurinus for him while they were all still alive has a relief of an axe, a *libella*, a flute, and a ruler. The inscription specifies that Appeus Augurinus was a flute-player. But why the technical tools? They may refer to the

[50] Gütschow 1938: 109. A similar case is the tomb of the baker M. Vergileus Eurysaces: *CIL* 1^2.1206; Ciancio Rossetto 1973; Joshel 1992: 81.

[51] A common funerary motif: Toynbee 1971.

profession of the son (a possibility which Zimmer sees as more likely).[52] Or then again, if the tools were not simply an identification device but also carriers of meaning about death, the combination *libella*/axe/ruler could refer to the way death operates on people: it cuts their lives off, equalizing them and giving the real measure of someone's life through the way they are remembered. The flute, as well as a pointer to the activity of the deceased, could thus be seen as inserting a note of reassurance or hope.

Another case of apparent mismatch between identity of the deceased and motifs on his tomb is the funerary altar of an association of firemen. It was dedicated by a Locius Patroclus to the members of the *collegium centonariorum*, together with a gift of the use of gardens; on the right-hand side it has the relief of a tree with birds, a lizard and a hare, and the now half-erased figure of a man with an axe – perhaps cutting down the tree, a reminder of mortality? On top of this, an axe and a ruler and, superimposed on them, a *libella*. Was Locius Patroclus a carpenter or a builder? Are the building instruments perhaps a reference to demolition work that the firemen may have engaged in? Or could the tools themselves be an intimation of mortality, juxtaposed with a metaphorical working scene where the axe is put to work in more senses than one?[53]

The possibility of the *libella* being more a symbol than a depiction of reality presents itself most insistently in a group of graves from Gallia Narbonensis, all of which are engraved with a small-scale pair of instruments: an axe and a *libella*.[54] There is the stele of the Novianii,[55] set up by a military trumpet-player for his mother, two brothers, two sons and wife. The bottom has a relief with an axe and a *libella* – was Novianius Honoratus a technician and, perhaps like Appeus, also a musician in his spare time? Were any of the other people mentioned in the burial involved in carpentry or building? Or are the tools simply an emblem of mortality?[56] And the sarcophagus of Benignus, described above, again points to the

[52] Zimmer 1982: no. 164, 213: Este, late first or early second century AD.

[53] Zimmer 1982: no. 165: now in Venice, original site Altino, second half of the first to the early second century AD. For bequests to professional associations, see van Nijf 1997: 48, 59, 177, 196–7. He casts doubt on the identification of *centonarii* with firemen.

[54] *CIL* 12.571, 12.689, 12.722 (tomb of Benignus, see above at n. 38), 12.813, 12.815, 12.927. According to the *CIL*, several other graves at Arles and Aix had a relief of an axe (without a *libella*). To these one can now add Gaggadis-Robin 2005: nos. 57, 58, 59, 60, 63 and 68 = *CIL* 12.689. All the sarcophagi in Gaggadis-Robin 2005 are from local workshops. Most of the material in *CIL* does not straightforwardly match that in Gaggadis-Robin 2005 and may now be lost.

[55] Espérandieu 1907: VII 5875, drawing only: Mayence, date unspecified. The inscription is *CIL* 13.11862.

[56] A similar problem is posed by Espérandieu 1907: VII 5858, where both deceased and commissioner were women.

possibility that the instruments depicted are not merely indicators of profession, precisely because plentiful information on the activity of the deceased is given by the epitaph. The axe and *libella* on Benignus' tomb are devoid of context, including the context of other objects. Visually, they are the equivalent of the consecration to the gods of the underworld, signified by the *D* and *M*. I think that they are simultaneously symbolic and literal. In other words, their immediate referent may indeed be Benignus' *ars*, but they also suggest the caducity of life and the fact that death is the great equalizer. The epitaph is resonant with linguistic metaphors and symbols, and with words that are simultaneously literal and allusive. The deceased was called Benignus and was in fact *benignus*, 'good-natured'; he knew how to build things and achieve powerful effects, but also how to nurture friendships. His achievements are described in terms of comparisons and asymmetries – fittingly, the emblem of levelness marks his grave now that all competitions are over.[57]

To summarize, our sample presents a full range of uses for the *libella* as a funerary image, from relatively straightforward pointer to the profession of the deceased, to carrier of symbolic meanings. Let us explore, at increasing levels of speculation, what those meanings may have been.

THE MEANINGS OF THE CARPENTER'S SQUARE

Identification through profession was only one possible way of having oneself represented after death, and not everybody chose it. Some people opted for a different type of group-orientated identification, or for greater individuality. Of course, shared skilled knowledge was not the only way a number of people could be constituted as a group: religion would be a common example of non-professional unification. In fact, professional identification was often characterized by shared religious rituals. Take the festival in honour of Daedalus and his nephew Perdix, who apparently discovered the saw and the compasses, making Daedalus so jealous that he killed him. The festival is depicted in a fresco from a carpenter's workshop in Pompeii: men are carrying a canopy with statues of Daedalus and Perdix, and of men at work with a seesaw and a carpenter's plane. Notice again the superposition of levels: images of carpentry depicted in an image on the wall of a carpenter's workshop to be viewed by, among other people,

[57] My reading is based on the *CIL* text; Waltzing 1899: III 529 agrees with the *CIL* text and points out the Benignus/*benignus* pun. Competition is a *topos* in epitaphs of technicians, see Burford 1972: 208–10.

carpenters.[58] Or take the cult of Athena/Minerva on the part of craftsmen in general. A relief of the goddess, from Rome, dating to the first century AD, depicts her ostensibly visiting a carpenter's workshop; the most remarkable visual element are the work instruments hanging from the wall and reproduced to a larger scale than the organic figures, including the goddess herself.[59]

The presence of professional associations,[60] often active in procuring a proper burial for their members, is well documented and reinforces the belief that the possession and practice of shared expertise was an important way for people to construct their identity as individuals and as part of a group within society. Some groups seem to have had a stronger professional identity than others, usually depending on their social status and/or the level of complexity of their work. While the literature on specific professions is not vast, studies exist on, for instance, soldiers, who seem to have strongly identified with a job which involved special practices and knowledge, and enabled the people involved in it to rise financially and economically. Looking at their funerary habits, while not all soldiers chose to be represented as such,[61] the great majority of them, from all over the Empire and throughout its history, preferred to be depicted with military *insignia*, or sometimes through the military *insignia* only.[62]

For an example which is closer to our interests, Hillert has studied ancient representations of doctors.[63] He indicates that most doctors advertised their professional identity in their epitaph or through (often idealized) funerary portraits as medical men at work, rather than through inorganic images of tools of their trade. Indeed, there are several examples of doctors in heroic poses, or portrayed simply as good citizens, while one fourth-century AD sarcophagus depicts the doctor in his study – some tools are visible on top of a cabinet, but the central objects are scrolls, in the hands of the man himself and carefully stacked on a shelf in the same cabinet.[64]

Many people seem to have enjoyed multiple or combined identities in a completely unproblematic way. Three notable examples are the altar of

[58] Ciarallo and De Carolis 1999: 121; Frontisi-Ducroux 1975. The fresco dates to the first century AD and is in house VI 7, 8–9, which also had a fresco of Daedalus and one of Fortuna, a divinity typically associated with craftsmen and traders, see Pugliese Carratelli 1993; Clarke 2003; cf. also Wrede 1981.

[59] D'Ambra 1993, 1998: 79–80. See also Colini 1947; Morey and Ferrari 1959: no. 96.

[60] E.g. Waltzing 1899; De Robertis 1973; van Nijf 1997; Bollmann 1998; Mennella and Apicella 2000.

[61] E.g. tombstone of M. Valerius Celerinus, in Fremersdorf 1957: pl. 9.

[62] See e.g. Anderson 1984; Franzoni 1987; Rinaldi Tufi 1988.

[63] Hillert 1990, cf. also Berger 1970; Donderer 1996 for epitaphs of architects.

[64] Hillert 1990: no. 29, from Ostia.

Titus Statilius Aper,[65] the tomb of Verrius Euhelpistus and his wife Verria Zosime,[66] and the relief of Publius Curtilius.[67] Aper was a *mensor aedificiorum*, and is portrayed in full-figure, wearing a toga, with some tools of the trade, including what looks like architectural plans, on his left and a dead boar with a putto on his right. The sides of the altar are engraved with measuring rods and writing implements. The inscription clarifies the presence of the boar and transports the *mensor* into a mythological dimension: 'Here, harmless Aper, you lie; not a maiden's wrath nor fierce Meleager pierced your body with iron. Silent death stole upon you unexpectedly.' *Aper* is 'boar' in Latin, and a boar was killed by Meleager in an episode which of itself was a very popular funerary motif.[68] As in some of the graves we have looked at above, layers of meaning are conveyed here: the young man is both the boar killed by Meleager and Meleager himself, prematurely deceased. The architectural plans and the closed box which visually dominate one side of the main relief could hint at a life that was never fully accomplished and was interrupted when still at the planning stage – projects never to be realized.

The second example, the tomb of Verrius Euhelpistus and his wife, seems to present two quite different faces to the viewer. Outside the funerary building, which was a sort of small cottage, hang three terracotta reliefs with smithy scenes, flanking an inscription just above the door. In all three reliefs humans are present, but each picture is dominated by instruments: a grindstone, featuring twice, and a vast array of knives, blades and sickles. The floor mosaic inside the funerary enclosure repeats the grindstone as central motif. On the other hand, the sarcophagus where Verrius Euhelpistus was buried, which originally would have been inside the tomb, accessible only to relatives and close associates, was carved with the story of (again) Meleager. In other words, the 'private' and 'public' sides of the burial follow two different modes of commemoration, which may indicate different commissioners (wife for the sarcophagus and husband for the plaques and the mosaic?). The former is mythology orientated, and possibly less unusual (rather than specially commissioned, the sarcophagus appears to have been pre-produced, with blank portraits to be carved in

[65] Zimmer 1982: no. 142: Rome, early Hadrianic times.
[66] Calza 1940: 26–8, 176, 251–3, 303–4, fig. 18, 27; Zimmer 1982: no. 117; D'Ambra 1988. Probably freedmen, in Ostia, Isola Sacra number 29, late Hadrianic to early Antonine.
[67] Kockel 1993: 174–5: origin unknown, mid-Augustan period. For another example of 'mixed' symbolism see Turcan 1999: 84.
[68] Koortbojian 1996: 229–31; Elsner forthcoming.

after sale); the latter profession-orientated and, for all its lack of a portrait, of a more individual stamp.

Thirdly, a relief to remember Curtilius Agat[honis?], a silversmith. The man, wearing a toga, holds what look like a scalpel or engraving tool and an object which could be an example of a finished product of his art, in its turn engraved with the figure of a naked man. As well as the now familiar multiplicity of levels of representation and production (an artefact representing a man holding an artefact representing a man), the relief is notable for its combination of *insignia* of labour and of leisured civic life (the toga) in the very person of the deceased, who activates them both, by explicitly displaying what could have been seen as a duality of identities.[69]

If we go back to the question raised at the beginning – how did ancient technicians, in particular the kind that did not leave written evidence, view themselves, a first answer is that, although the majority of them did not leave funerary monuments that have survived, or did not choose a strong professional identification for their funerary representation, a significant number of lowly technicians did view themselves primarily, or co-primarily, as technicians. They viewed themselves as people who produced artefacts, worked with particular instruments, and whose knowledge and role in society were distinctive. Moreover, no sign is detectable that for these people professional and public roles were at odds with each other – being a technician was presented as an important part of, when not *the* main, social persona. We can be more specific and ask, why identify the profession through tools?

The presence of objects in burials has a very long history. In several civilizations across the Mediterranean, it was customary to be buried together with objects of common use, so that the deceased could continue what they did in life in its aftermath.[70] Even pictures of objects could serve the function of the objects themselves, the way portraits of the deceased functioned as the person him- or herself.[71] In the imperial period, the practice of burying objects seems to have become rare, but is not unheard of: for instance, an abacus has been found in a grave in the region of Aosta, and surgical instruments have turned up in doctors' burials.[72] Much more

[69] Kockel 1993 finds this unusual, but there are similar examples: Espérandieu 1907–81: vol. IX 7012 (1925); Braemer 1959: nos. 34, 39, 59, 66; Zimmer 1982: no. 54. Cf. also Kampen 1981.

[70] For funerary representations of work instruments which perhaps fulfil the same function, see the report on graves in the Dorylaion area in Turkey by Noack 1894.

[71] Gütschow 1938: 108.

[72] For the abacus: Mollo Mezzena 1981, who dates it to the late first century AD; Fellmann 1983. For doctors: Jackson 1990.

frequently we find representations of objects accompanying and marking the burial, in basically three forms, sometimes combined: tools only, work scenes with someone clearly recognizable as the deceased at work, and work scenes with the deceased not at work but in a supervisory role or even out of the picture. Incidentally, the *libella* only ever appears as a tool on its own, and never as part of a work scene. Some areas or burial sites seem to display a preference for one type of representation: several of the graves in Neumagen, for instance, bear reliefs with work scenes, but hardly any have inorganic work instruments. Some of the graves in Ostia's Isola Sacra, on the other hand, have work scenes juxtaposed with inorganic tableaux of instruments.[73]

Because they make a more immediate reference to the lifetime activities of the deceased, work scenes might be said to be more realistic than instruments in isolation, which instead display, I would argue, a more immediately symbolic function. As I have mentioned, in our extant examples the *libella* is found predominantly in inorganic contexts – although its direct reference value should not be discounted, the fact that it does not appear in work scenes reinforces its significance as an emblem or a symbol. Also, if on a tomb the inorganic prevails over the organic, it is as if the person itself in a sense becomes his or her trade, i.e. his or her instruments, and an element of complication enters the realism of the image. Ultimately, the distinction itself between realist and symbolic must be problematized, and a corresponding iconography of technical instruments must be articulated. The only tool whose complexity of meanings has long been recognized is the axe, perhaps the most common technical funerary icon of them all. Especially in conjunction with other tools, images of the axe may have referred simply to the profession of the deceased; yet, its appearance as a small device, almost an amulet, on the graves of people who do not obviously seem to have been builders or carpenters, has prompted the reflection that its use was symbolic, perhaps linked to religious affiliations – Pythagorean at first, Christian later. Interpretations of the specific symbolism of the *ascia* have involved its role in digging graves, and its similarity with death, which fells lives as the axe does with trees.[74]

Thus, the ancient viewer read the representation of the technician through his or her instruments at several levels. The border between what the image referred to in the real world and what it signified in the

[73] Von Massow 1932; Kampen 1981, respectively.

[74] Carcopino 1957; Susini 1960: 119–20; Pannoux 1985: 298–9; Gaggadis-Robin 2005: 193 with further references. For other objects, Zimmer 1982: nos. 128, 129, 130, 131.

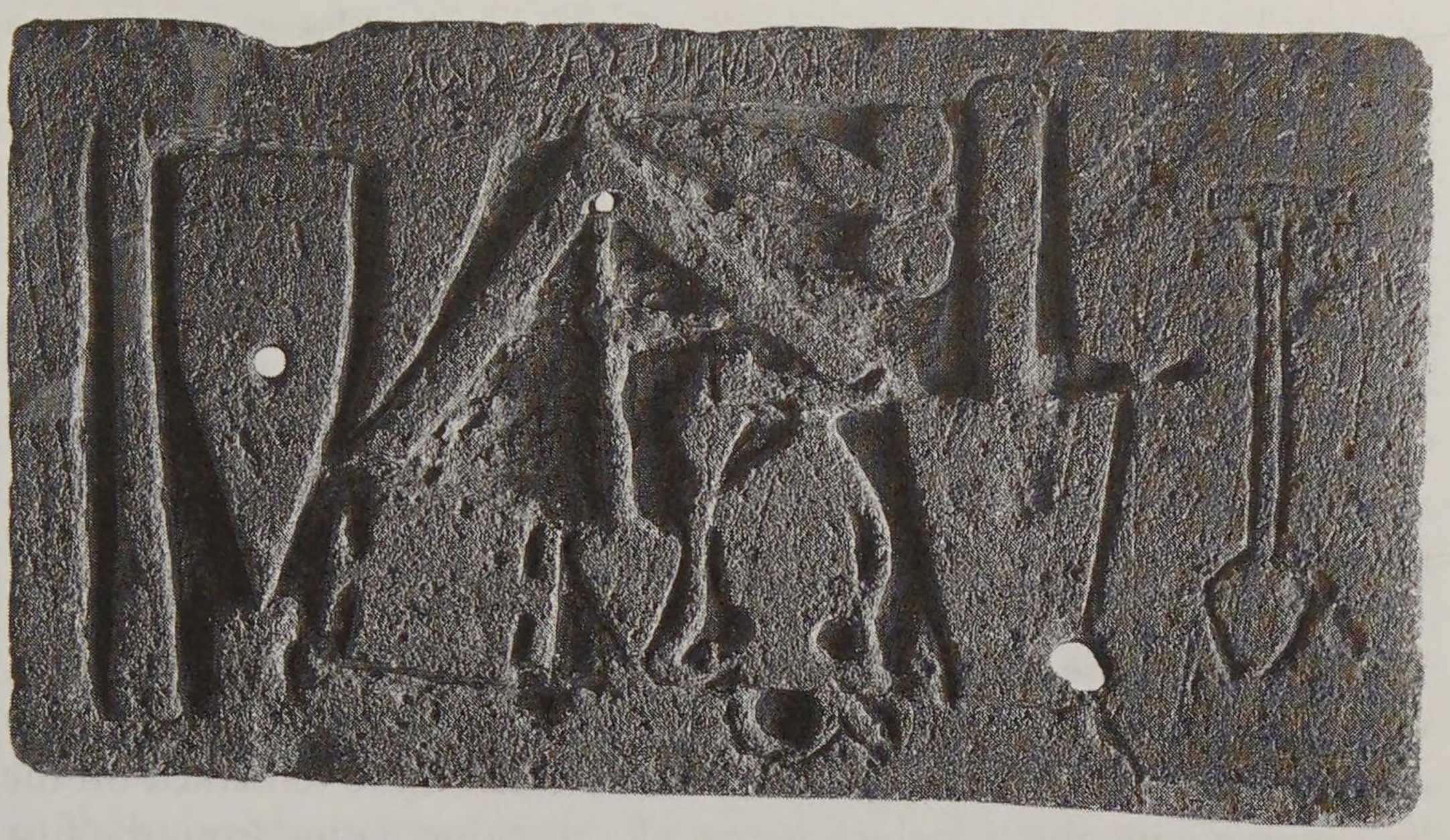

Figure 3.4 The Diogenes plaque: Pompeii, SAP (Soprintendenza Archeologica di Pompei), inv. 14210.

world of symbols was blurred. Work instruments and scenes functioned as identification devices – they both explained what the person did and how important it was for them, or how important they thought what they did should be for society at large. Work instruments and scenes could be both a narrative of the life of the deceased and an emblem of it. We could say that tools on tombs were a metonymic pointer to the life of the technician, and also that they function as quasi-totems. By totems here I mean objects which characterize someone's activities and identify their role to the point of embodying their (divinely regulated) fortune or their life itself. Take a non-funerary item from Pompeii: the plaque in fig. 3.4, found in the so-called *Casa del Marinaio* (House of the Mariner, VII 15, 2), a large building which was further enlarged and modified several times in the course of its existence. The house is well decorated and has several nautical motifs, hence the name; the plaque itself, in tufa, has been dated to the end of the first century BC or the beginning of the first AD.[75] The top border has a short graffito-like inscription, 'Diogenes structor', and the main space is occupied by a *congeries* of tools: there is a plumbline, an upturned jar, a

[75] Zimmer 1982: no. 99; Pugliese Carratelli 1990: VII 765. Another example of a phallus pointing upwards on a shop plaque from Pompeii in Zimmer 1982: no. 134. Another plaque with technical tools, including a *libella*, perhaps to be placed in a funerary context, in Zimmer 1982: no. 104. Phalli as iconographic motifs in funerary art are found at Ghiza in Tripolitania, see Brogan and Smith 1984.

chisel, perhaps a carpenter's plane, and what looks like a propitiatory phallus pointing upwards, right above a *libella* which occupies the central position.

The plaque was not part of a burial and it does not seem to have marked a shop, because it was placed high up on the outer wall of a very wealthy house. It has been suggested that it was left there by the builders engaged in one of the house's enlargement phases, perhaps as a memento or, in my view, as a propitiatory object, a kind of amulet-cum-totem to protect against the hazards of the profession while the works were carried out and to protect the finished artefact afterwards.[76]

'Totemic' displays of objects are not infrequent in Roman art: a well-known example are the Republican reliefs from Piazza della Consolazione, which show Roman weapons juxtaposed with war spoils, with the latter depicted on a smaller scale.[77] Moreover, historians have remarked on the 'fascination with objects' which is part of a tradition dating from the first century BC;[78] on the emphasis on inorganic forms over organic ones,[79] and on how work instruments, tools of the trade, could become 'humble insignia or artisanal heraldry' for ancient technicians.[80]

CONCLUSION

If being a technician was at least sometimes denoted by means of quasi-totemic tools, several consequences can be drawn in terms of how ancient technicians viewed themselves and their shared knowledge. Firstly, as we have already said, at least some of them will have identified strongly with their *techne* or *ars*,[81] and advertised their profession as the main, or a significant, part of their social persona. Secondly, the identification through specialized knowledge will not have been primarily with a set of notions or ideas such as would traditionally be contained in a text. The emblem of technical knowledge as seen by its practitioners was not necessarily or not primarily a scroll or writing implements, as was generally the case for philosophical or literary knowledge[82] – not a canon of texts or the

[76] Pugliese Carratelli 1990: VII 765. A parallel can be found in the reliefs on the ceiling of the large underground crypt of Monte di Cuma: a mallet, two axes and four wedges. The crypt could have been dug in late Republican times, and restored in Augustan times, cf. Maiuri 1947: 119–22; Donderer 1996: 32. Similar remarks in Clarke 2003: 109 about the fullery scenes in Verecundus' shop in Pompeii.

[77] D'Ambra 1998: 34–5. [78] Kampen 1981: 81. [79] D'Ambra 1998: 47.

[80] D'Ambra 1998: 48. Cf. also Felletti Maj 1977: 324–5 and Franzoni 1987: 104–7 for similar observations on the representations of weapons on soldiers' tombs.

[81] Cf. also Pannoux 1985: 295. [82] Wrede 1981; Zanker 1995b.

capacity to interpret them, but an instrument. Technical knowledge was explicitly seen as concerned with making something, with material rather than literary, or purely 'abstract', culture.[83] Although several technicians did make the transition into literate culture, *techne* and *ars* remained inevitably non-literary, also given the economic and social status of most practitioners. In fact, we could go one step further and claim, on the basis of the funerary evidence, that the 'materiality' rather than literariness of technology, its residing in instruments and tools rather than in texts or theories, was not only acknowledged, but celebrated and displayed.

The picture on the cover of this book is another non-funerary item from Pompeii – a small mosaic, originally used as a table top in the outdoor *triclinium* of a large house which was at least partially occupied by a tannery.[84] The startling image it presents is that of a skull (possibly modelled after the skull of a monkey) hanging from a carpenter's square, in the guise of a piece of lead hanging from the plumb line. The skull rests on a butterfly which in its turn rests on a wheel; the *libella* is supported on one side by a draped piece of purple cloth and a crown, and on the other by a travelling cloak with stick and satchel. The various objects have been read as symbolising the poor on the one hand and the rich and noble on the other, who are united and levelled in death. The wheel is the wheel of fortune, and the butterfly is a common image for the soul.[85] The association is, as one historian has said, 'easy to grasp': the carpenter's square conveyed the idea that death is the great equalizer.[86]

Similar messages of *memento mori* are often found both in ancient art and literature as part of philosophical and highbrow literary reflections on the afterlife, and on the fragility of life's pleasures. The Pompeii mosaic has generally been seen in the same light. Note, however, the deliberate accuracy with which the Pompeii *libella* is reproduced (metal cappings, tiny bolts). Note also that the Pompeii mosaic is not unique: apart from other small objects,[87] a strikingly similar image is preserved as a bronze

[83] Joshel 1992: 24.

[84] Now in the Archaeological Museum of Naples no. 109982; found in house I 5, 2 (h), dated to mid-first century BC. Cf. Deonna 1932: no. 61; Ferrari 1989: mosaics 27; Pugliese Carratelli 1990: I 185. The identification with a tannery is due to the presence of tanks for the treatment of hides, substances used for the treatment, and knives to cut hides.

[85] Thus I. Bragantini in Pugliese Carratelli 1990: 192.

[86] Brendel 1934; Gütschow 1938: 110–11 (quotation).

[87] There are similar images: see Fossing 1929: no. 1639: a first or second century AD fragmentary gem engraved with a skull and a small *libella* above it. Deonna 1932: no. 62: a medallion, no longer extant, with a skeleton sitting on an amphora, holding a cornucopia, its feet on a wheel and a carpenter's square on its head. Cf. Dunbabin 1986 for related examples.

Figure 3.5 The skull-shaped bronze weight: Palais des Beaux-Arts de la Ville de Paris, Musée du Petit Palais, Collection Dutuit, inv. DUT. 60.

weight for a steelyard in the shape of a skull with a butterfly on top of it.[88] The functioning of a steelyard requires in fact an equalizing operation between weights and wares.

As we have suggested, some reflections about death had been formulated by technicians, and expressed through tools of the trade that functioned not only as pointers to a profession, but as repositories of symbolic meaning. If we bring the iconography of the *libella* we have articulated so far to bear on the traditional interpretation of the Pompeii mosaic, a further, and more unsettling, possibility emerges.

A statement acquires meaning from the context in which it is communicated, and a statement which has a particular meaning in its original context can acquire a different meaning if its context is changed, perhaps through appropriation or copying.[89] No matter where the idea that death is the great equalizer originated: once it is inscribed on the grave of a carpenter, or embodied in a steelyard weight used in commercial transactions, or placed a few metres away from tannery vats, their smell occasionally making its way to the outdoor *triclinium*, that message becomes something else. For a Seneca to proclaim the eventual equality of all men

[88] Petit 1980: no. 95, probably late first century BC, now in the Louvre, origin unknown (but it might be Italian or even from Campania).

[89] Beard and Henderson 2001.

may be rather patronizing. But if a carpenter does it, it takes on a different, dangerous, edge. That the rich and the poor will be the same does not pack the same menacing punch when uttered by a wealthy senator and by an ex-slave – even a wealthy one. Thus, some of the meanings of the *libella* may have been polemical, even subversive, and can be related to discourses on the ethical, social and political significance of expert knowledge, as voiced by the technical writers – Vitruvius, Hero, Galen – mentioned at the beginning of this chapter.[90]

In other words, the iconography of the *libella* suggests the possibility that at least some technicians, albeit mostly 'invisible', upheld values which, while superficially similar, were at odds with those of the upper classes. This goes against the deeply entrenched postulate of the marginality of ancient technicians (what I have characterized as the 'mainstream' view). More than that: Zanker and others have seen the increasingly expensive and visible graves of technicians, in the period from the first century BC to the early second century AD, as a function of the increased status, wealth and visibility of new groups of people, in particular former slaves whose profession had made them socially mobile. Some art historians have seen the 'upwardly mobile technicians' and freedmen in general as bearers of a particular stylistic signature (the so-called *arte povera*), more intent on realistic depiction of everyday pursuits than on conveyance of symbolic meanings. In both cases, the underlying assumption appears to be that the upwardly mobile groups had no or little political import, were basically happy to conform, and that they had to borrow their symbolism from the upper classes when they wanted to express anything other than a realistic description of their circumstances.[91]

I think our analysis of funerary art, and in particular of the iconography of one technical instrument, may offer a glimpse into possibilities other than marginality and depoliticization. By expressing pride in their activities, strongly identifying them with making and practising, and finally by using a symbol of technical activities to convey a message of equality, some technicians at least were going against the grain of what some historians have seen as the mainstream view. They celebrated a form of knowledge

[90] Joshel 1992: 56, 161, 165. Clarke 2003: 98–105 has the interesting example of a frieze frescoed with cupids carrying out various tasks, including fulling cloth. The fresco is in the House of the Vettii, who were wealthy freedmen. I think this presents different interpretative possibilities than Clarke's conclusion suggests: 'it was a way of sanitizing the viewers' servile past' (105), especially since 'the notion of overturning expectations – especially those of the ruling elite – constitutes an important theme' (271).

[91] Cf. e.g. van Nijf 1997: 38; Clarke 2003 who makes this point particularly strongly.

which was alternative to other forms of knowledge, and a social role, that of the expert, the skilled maker of things and producer of results, which again, perhaps deliberately, posed itself as an alternative to other social and public roles, such as those determined by birth, connections, or a literary education.

How did the ancient 'invisible technicians' see themselves? Much further research is needed in order to give an exhaustive answer to that question. For now, however, we can definitely conclude that their invisibility is not an objective fact – ancient technicians were not invisible to themselves, or to their immediate peers – but, once again, a consequence of selective blindness on the part of some observers, both ancient and modern.

CHAPTER 4

Boundary disputes in the Roman Empire

Did technical knowledge play a significant role in the administration of the Roman Empire? The remains of bridges, roads, aqueducts, that punctuate the landscapes of Spain, Libya, Turkey, testify that it did. The Empire itself could to an extent be identified with the provision of technologies that modified the lives and material world of people through transportation, water, public spaces. Yet, discussions of Roman imperial administration tend to emphasize the role of patronage or, at most, a literary education, and to downplay the importance of expertise.

This chapter will try to shift the focus, by concentrating on one particular form of technical knowledge and technical activity: land-surveying. The archaeological traces of land-surveying are numerous, as are the inscriptions relative to it. We also have a collection of texts in Latin, known as the *Corpus Agrimensorum Romanorum*. The core group of treatises (by Frontinus, Siculus Flaccus, Balbus and two people both called Hyginus)[1] date from the first and second centuries AD. Many of the later authors (the most notable being Agennius Urbicus, c. fourth century AD) draw or comment on earlier ones. Taken together, the evidence convincingly shows that land-surveying was a major factor in the Roman expansion into the Mediterranean and beyond ever since late Republican times. For instance, North Africa, after the fall of Carthage, was extensively 'centuriated' (divided up into square parcels called *centuriae*), as well as provided with roads, bridges, aqueducts and geometrically planned towns.[2]

The land-surveyors, many of whom belonged to the army, contributed their expertise to the acquisition, conquest and resettlement of new territories. Among their many activities – surveying, division and distribution

[1] Following Campbell 2000, I call them Hyginus 1 and Hyginus 2.

[2] The literature is quite substantial: see e.g. Dilke 1971; Hinrichs 1974; Gabba 1984; Friggeri 1985; Behrends and Capogrossi Colognesi 1992; Chouquer and Favory 1992; Campbell 1995, 1996 and 2000; Lewis 2001.

of land – I have chosen to focus in this chapter on the settling of disputes, specifically in the period from Trajan to Hadrian (AD 98–138).[3] Land disputes occur when there is disagreement about boundaries, ownership, right of way, access to resources like water, eligibility of a property for tax, and so on. Crucially, disputes occur *after* a territory has been occupied and distributed: thus, the settling of disputes about land-surveying may be seen as an example of technology-in-use. From the point of view of our initial question, then, we would be looking not at the (possibly more urgent) phase of Roman conquest, where the problems were mainly occupation and re-distribution of land, but at the more everyday phase of maintenance of a provincial territory – its administration.

Solving land disputes even today involves the appointment of a person or persons whom all sides can trust and whose decision they agree to accept. This can be done in different ways. From early on in the Greek world, many controversies were decided by envoys from a neutral city, who appear to have been eminent citizens – people of good character – rather than experts in land administration, or people well acquainted with the specific territory at hand.[4] In Republican Rome, boundary disputes between private citizens were often resolved through the so-called *demonstratio finium*, whereby the interested parties pointed out or 'demonstrated' the limits of their property to assembled, presumably trustworthy, witnesses.[5] In imperial Roman times, land disputes came to be seen as problems that could not be solved by people whose only credentials consisted in being well-respected members of the community. We increasingly find the notion that, in order to express the right decision, one has to *know* about boundaries, land administration, land allocation, or at least one has to know how to assess other people's testimonies in the right way. In order to be trusted by all parties involved, the arbitrator must embody some higher authority: either political – an imperial officer – or epistemic, the authority of expertise – a surveyor.[6]

Even though these scenarios can be historically situated, 'new' ways of solving disputes did not entirely supplant 'old' ones. People operating in our time-period had a range of possible procedures available to them, and

[3] Burton 2000 and Campbell 2000 list the relevant epigraphic evidence.

[4] E.g. Bourguet 1911; Jameson 1994; Burton 2000. [5] Daube 1957.

[6] This is not to say that sharp distinctions should be drawn: political authority could be combined with technical and/or legal expertise. Again, this is not to say that character became unimportant. On the contrary, political authority was continuously constructed as inseparable, or even derived, from moral qualities; the writings in the *Corpus* also insist on the necessity for the surveyor to be virtuous. For a similar trend in the administration of justice in general, see Schiavone 1987; Bretone 1989: 247–9.

had to negotiate the existence of three potential sources of authority: the local community, the Roman government through its officers, and the experts, i.e. the land-surveyors. As I will argue, they often made a choice about what is essentially a technical problem on the basis of considerations other than technical efficiency. Moreover, the way they represented or advertised the decision-making process and the outcome of the decision was loaded, rather than a neutral description of the facts. In other words, land disputes were settled in ways, and represented in ways, that were deeply affected by their social, political and economic context. They were not simply a technical issue.

But let us turn to the evidence. A lot of information, especially on the regulation of disputes between private landowners, is to be found in our juridical sources, but since my main focus will be on disputes concerning communities, I will concentrate on three types of sources which in turn embody at least three different viewpoints on land disputes: the technical treatises, the non-technical texts, and inscriptions recording the outcome of actual disputes. I will devote more time to the inscriptions, as a way of showing what a rich, and as yet unexploited, goldmine they can be for the history of ancient technology.

THE NON-TECHNICAL VIEWPOINT

The literature of the first two centuries of the Empire abounds in references to boundary disputes, giving the impression that they were quite a common occurrence. In Lucian's account of space travel, the main character Icaromenippus, reporting about his journey to the heavens, comments that land disputes seem risible when viewed from up high, since the property that people fight about looks as minuscule as an atom. Apuleius tells the sad story of an entire family massacred as a result of a boundary dispute gone sour, and elsewhere rhetorically contrasts going to court over the borders of fields (*fines agrorum*) with teaching about good and evil (*fines bonorum et malorum*).[7]

An earlier story, found in Cicero and repeated by Valerius Maximus, is presented by both authors as an example of fraudulent interpretation of the law.[8] In 183 BC Q. Fabius Labeo was appointed by the Roman Senate to arbitrate a boundary dispute between Nola and Naples. He talked to both

[7] Lucian (AD 120–80), *Icaromenippus* 18; Apuleius (c. AD 123–80), *Metamorphoses* 9.35–6 (a *demonstratio finium* is involved), and *Apologia* 15, respectively.

[8] Cicero, *On Magistracies* 1.10.33; Valerius Maximus (first century AD), *Memorable Doings and Sayings* 7.3.4.

parties separately, inviting them not to be greedy and to be prepared to make concessions. Both relented, with the result that an unclaimed strip of land was left in the middle of the contested territory, which Labeo gingerly proceeded to assign to the Romans. A similar episode, alleged to have taken place in 446 BC, is told by Livy (c. 64 BC–AD 17). The two communities of Aricia and Ardea had asked the Romans to arbitrate a land dispute. The assembly convened to discuss the case included patricians and plebeians, one of whom, Publius Scaptius, told them 'of matter erased by the lapse of time, but fixed in his own memory', and specifically that the disputed land formed part of the territory of Corioli, and when that city was taken, became by the right of war part of the state domain of Rome. Scaptius was so persuasive that the Romans claimed the disputed land as their own. Livy, interestingly, points out that the senators and consuls were against the final decision; in fact, they would not have allowed Scaptius, 'a meddling old hanger-on of assemblies', to speak, had the tribunes of the plebs not intervened in his favour. The social conflict parallels the clash of two incommensurable arguments: the patricians argue against annexing the land on the basis of the Romans' reputation, honour and character; the plebeians support their case through recourse to what I would call special knowledge, i.e. Scaptius' memory and personal experience. He is a privileged witness, because, as he claims, he was there.[9]

A similar parallel between social order and degrees of knowledge is found in Seneca (3 BC–AD 65), who famously commented about the value of liberal studies thus:

> The mathematician (*geometres*) teaches me how to measure my estate; but I should rather be taught how to measure out how much is enough for a man to own. He teaches me how to count [. . .] but I should prefer him to teach me that there is no point in such calculations [. . .] What good is there for me in knowing how to divide a piece of land into shares, if I do not know how to share it with my brother? What good is there in cleverly adding together the feet in a *iugerum* [Roman unit of area measurement], and in detecting the error if a piece has so much as escaped my measuring-rod, if I am embittered when an ill-tempered neighbour merely scrapes off a bit of my land? The *geometres* teaches me how I may lose none of my boundaries; I, however, seek to learn how to lose them all with a light heart. 'But', comes the reply, 'I am being driven from the farm which my father and grandfather owned!' Well? Who owned the land before your grandfather? Can you explain what people (I will not say what person) held it originally? You did not enter upon it as a master, but merely as a tenant. [. . .] what you hold, what you call your own is public – indeed, it belongs to humankind.[10]

[9] Livy 3.71–2, Loeb translation with modifications. See Scuderi 1991.
[10] Seneca, *Letters to Lucilius* 88.10–12, Loeb translation with modifications.

A thorough analysis of Seneca's position here would require at least a chapter by itself, but let me just note the association of land disputes – indeed, land property itself – and of the technical knowledge relative to them, with a decline from previous, better, times. 'Originally' land was owned in common; no disputes or boundaries, and presumably no *geometres*, existed. Already Virgil and Tibullus, followed by Horace and Ovid, had listed the absence of boundaries as one of the features of a mythical golden age.[11] Plutarch not only confirms, like Cicero and Livy, the association of boundaries with liminal moral situations, but, like Seneca, tells a tale of origins, in his specific case the birth of the Roman state. He reports that Romulus killed his twin brother Remus over what was basically a boundary dispute, and in the *Life* of Numa, another early king of Rome, he states:

> [Numa] was also the first, they say, to build temples to Pistis/Fides and Terminus [. . .]. Terminus means Boundary, and to this god [the Romans] make public and private sacrifices where their fields are set off by boundaries; of living victims nowadays, but in ancient times the sacrifice was a bloodless one, since Numa reasoned that the god of boundaries was a guardian of peace and a witness of just dealing, and should therefore be clear from slaughter. And it is quite apparent that it was this king who set bounds to the territory of the city, for Romulus was unwilling to acknowledge, by measuring off his own, how much he had taken away from others. He knew that a boundary, if observed, fetters lawless power; and if not observed, convicts of injustice.[12]

Without wishing to ignore the individuality of each author, a consistent picture emerges from the literary sources: the significance of land disputes goes far beyond a few acres of arable ground. At stake are the possibility of justice and the almost inevitable triumph of injustice; controversies are seen as both a historical product and a cultural emblem of the passage from a golden to an iron age, from a blissful state of nature to one where greed and deceit, sometimes associated with the lower classes of society, prevail.

THE SURVEYORS

Technical texts offer a rather different perspective. The *Corpus Agrimensorum Romanorum* deals extensively with disputes – surveyors were expected to be able to distinguish one type of controversy from another, and to contribute to their resolution by means of their distinctive

[11] Virgil (70–19 BC), *Georgicae* 1.125–8; Tibullus (55–19 BC), *Carmina* 1.3.41–44; Horace (65–27 BC), *Odes* 3.24, 5–13; Ovid (43 BC–AD 17), *Metamorphoses* 1.127–36.

[12] Plutarch, *Life of Romulus* 10.1–2, *Life of Numa* 16.1–2, Loeb translation with modifications.

skills. In fact, the ability to facilitate the outcome of a dispute was a standard against which good and bad surveyors could be measured, both in terms of their technical abilities and of virtues such as fairness and honesty.

There are many different kinds of dispute: about boundaries (*de fine* or *de finibus*), boundary markers (*de terminis*), area or extension (*de modo*), place or site (*de loco*).[13] Even if many of the surveying treatises offer taxonomies, there was a great degree of overlap and potential confusion between different types of disputes. Classifying a controversy was complicated,[14] but also important in order to choose the appropriate resolution procedure.

Boundary disputes are probably the most commonly recorded incident. Land could be delimited by man-made *limites* or or by territorial markers. The former consisted of rectilinear roads or ditches, set in place by surveyors often as part of a centuriation, and often orientated in the direction of the four cardinal points. The latter could be natural features (rivers, ridges), graves or trees that were distinctive either because planted out of a line or because not characteristic of the region.[15] Generally, our texts do not differentiate much between these two types of markers, but one passage in the late ancient *Liber coloniarum*, relative to the town of Veii, evidences potential conflicts.

> In case anyone thinks that they ought to follow (as boundaries) those river banks that begin inside an area of land and then die out on their own side (i.e. without coming in contact with a boundary between properties), the regulation pertaining to *limites* has ruled them out in advance. This regulation also forbids us to follow anything that the greater authority of the *limites*, and the direction of the straight line boundaries, do not confirm. However, if the parties, in order to reach an agreement, have decided to keep these banks (as boundaries) between their properties, that should not be ascribed as a fault to a straight line boundary; rather, trust must be placed in the agreed boundary definition.[16]

Of the two types of boundaries here, *limites* and river banks, the text inclines towards the former, which are rectilinear boundaries, endowed with 'greater authority'. At the same time, it recognizes the existence of

[13] Frontinus, *De controversiis* 4.24–6; Agennius Urbicus, *De controversiis agrorum* 24.33–26.15. Here and henceforth references to, and English translations of, the land-surveyors' works are from Campbell 2000 unless otherwise indicated.

[14] Frontinus, *cit.* 4.4–10; Agennius Urbicus, *cit.* 24.16–31, 30.17.

[15] Frontinus, *cit.* 2.5–22; the use of natural markers is characterized as ancient ('*secundum antiquam observationem*', *ibid.* 2.18–20). Cf. also Hyginus 1, *De condicionibus agrorum* 78.21–32, *De generibus controversiarum* 92.13–19. The main *limites* were called *decumanus* and *cardo*.

[16] *Liber coloniarum* 172.21–6.

another source of authority: the parties on the ground, as it were, who evidently favoured the retaining of natural, easily identifiable, markers such as the river banks. The solution is a compromise; the potential conflict between local circumstances and general principles is mitigated by appeal to 'trust' and 'agreement', two key terms often found in similar contexts.

Beyond clashes between different, yet visible, boundary markers, there was the problem of markers which were no longer easily identifiable. The resolution of many boundary disputes involved simply recognizing markers, distinguishing false from true ones,[17] and on the basis of them reconstructing a line, a continuous and determinate border. Sometimes the surveyor needed an instrument in order to draw or identify straight lines,[18] sometimes he had personally to inspect the place,[19] and sometimes he was able to consult a map. Even in the presence of a map, one needed to be able to read it. The mere ability to do so could differentiate the expert from the lay person. According to Agennius Urbicus, even if one has a map and a large landmark (in his example a grove) signalling the boundary, several problems may arise: the *modus* (size or dimensions) indicated may be correct, but located in the wrong place on the map; or the size and location may be correct, but the allotment may have a different shape, 'with reduced angles and shorter boundaries'.[20] All this made the correspondence between map and real landscape difficult to decipher for any but a skilled surveyor.

Some authors report on tricks of the trade: Siculus Flaccus suggests that the surveyor look at religious customs, and to what extent of territory they are performed on, in order to understand where one town ends and the other begins.[21] If a previous survey is available but one does not know whether it is reliable, Hyginus 1 recommends checking the neighbouring properties which are not under dispute to see whether they correspond to the document.[22] Despite harsh penalties, boundary markers were sometimes disturbed, and Agennius Urbicus comments:

[17] E.g. the surveyor should be able to distinguish a tomb which is used as a marker from one which is not: Hyginus 1, *De condicionibus agrorum* 80.10–11; Siculus Flaccus, *De condicionibus agrorum* 106.14–16; *Liber coloniarum* 190.23.

[18] See the procedures described by Frontinus, *De arte mensoria* 12.16–14.24. On surveying instruments see Lewis 2001.

[19] Hyginus 1, *De generibus controversiarum* 94.21: 'res oculorum'.

[20] Agennius Urbicus, *De controversiis agrorum* 34.12–27. Cf. also Hyginus 1, *De condicionibus agrorum* 100.2–3.

[21] Siculus Flaccus, *De condicionibus agrorum* 132.7–15.

[22] Hyginus 1, *De condicionibus agrorum* 80.1–2, 96.23, cf. also Siculus Flaccus, *De condicionibus agrorum* 106.4–5.

[i]t will be part of the surveyor's skill to decide, according to the position of the adjacent angles, how far a marker has been moved and by what principle it should be restored to its proper place. It is very easy to undermine the inexperience of a surveyor or someone else who does not appreciate that there is a system in the line (of boundary markers). Indeed it often happens that the inexperience of surveyors lends audacity to landholders. The angles at which boundaries meet one another, not only right angles but also obtuse and acute, are never without some system. If we do not turn a blind eye, we shall through our skill easily restore to this system whatever unskilled people have disturbed.[23]

The scenario described by Agennius is one of conflict, where the surveyor can prevail over audacious yet unskilled landholders thanks to his expertise, which is here characterized above all as experience in the identification and reading of signs. These could be not just big objects, but tokens (ashes, charcoal, pottery, broken glass, small coins, tops of wine jars) buried in the ground, or written ciphers: the Greek letter *gamma*, a cross, a string of Latin letters, drawings of animal parts (a wolf's paw, a bear's paw, and so on).[24]

The bewildering diversity of potentially meaningful signs that the surveyor was required to filter out of the 'noise' of elements present in a territory under dispute was aggravated by the fact that there were regional differences in the layout of boundary stones,[25] in the way those stones were inscribed,[26] and even in the way areas were established: some people did that through estimation (*opinio*) of an area and a descriptive account of its boundaries, rather than through a survey (*mensura*).[27] The practitioner had to play it by ear: colonial land, which was exempt from taxation, was not to be divided in the same way as land that was liable to tax (*vectigalis*); in some provinces one paid a fixed proportion of the produce, while in others the basis was land fertility, assessed by *iugerum*; *decumani* and *cardines* and the square-shaped Roman *centuriae* were not always the best technical tool for land division. In some cases, division by rectangular *strigae* and *scamna*, which some scholars associate with pre-Roman or in general non-Roman land division, was seen as more appropriate.[28]

[23] Agennius Urbicus, *De controversiis agrorum* 26.35–28.7, translation in Campbell 2000 with modifications. Cf. also Hyginus 2, *Constitutio limitum* 138.1–28.

[24] Hyginus 1, *De generibus controversiarum* 92.26–7; Siculus Flaccus, *De condicionibus agrorum* 106.22–7, 108.6–7, 19–27, 110.23–5; *Liber coloniarum* 190.17, 34; *Ex libris latini de terminibus. Latinus v. p. togatus* 230.14–35.

[25] Hyginus 1, *De condicionibus agrorum* 80.9, 88.22–32, 92.21–2; Hyginus 2, *Constitutio limitum* 138.2.

[26] Hyginus 2, *Constitutio limitum* 138.1–28.

[27] Hyginus 1, *De generibus controversiarum* 98.11–12; Siculus Flaccus, *De condicionibus agrorum* 130.9–11.

[28] Hyginus 2, *Constitutio limitum* 160.22–162.23; see Hinrichs 1974: 35–42.

When different measurement systems exist, Hyginus 1 indicates that official figures should be given in both Roman and local units. But,

> if there was a dispute whether a *versus* [a Dalmatian unit of measurement] had 8,640 feet, confidence [*fides*, which also means 'trust'] could nevertheless be placed in the *iugera*. [. . .] When the *iugera* have been recorded, even if something can be <done> using local terminology, a system involving *iugera* will be inherently reliable for us.[29]

The desire for stability and systematization of measures unsurprisingly tends to privilege Roman standards, but is tempered by the recognition of local realities and local networks of consensus: '[e]ach region follows its own practice so that a trustworthy method (*fides*) can be agreed upon'.[30]

As well as geographical diversity, with differences spread over space, as it were, there were historical differences, with strata of habits and customs accumulating over time. According to Hyginus 1, the surveyor should keep in mind ancient authorities, or the previous circumstances of a region, in the form of a map or simply of transmitted memory of certain transactions. The task may become almost archaeological: in certain ownership disputes, one should trace a straight line by uncovering boundary markers 'for men of old have imposed upon him these points that he should seek out'.[31] Typically, ancient markers to look out for include hollows in the ground, terraces, slopes, banks or trees planted in a distinctive way.[32] In general, '[w]e must watch out <for the practices of> different regions in case we seem to be doing something unusual. For our profession will retain its integrity if we also conduct our investigations principally according to the practice of the region'.[33]

'Integrity' is key, and the emphasis on moral qualities runs through the whole of the *Corpus*: it was imperative that the surveyors' technical expertise be compounded with a respectable character, especially given that specialized knowledge *on its own* was never officially acknowledged as the ultimate authority about land disputes. Figures other than the surveyor, embodying different sources of authority, could be called upon to resolve a case. Surveyors could act as 'expert witnesses' either before a dispute was

[29] Hyginus 1, *De condicionibus agrorum* 88.23–90.12, especially 88.25–32. Cf. also *ibid.* 96.23–4.

[30] Hyginus 1, *De generibus controversiarum* 92.24–5. See also *Ordines finitionum. Latinus et Mysrontius togati Augustorum auctores. De locis suburbanis vel diversis itineribus pergentium in suas regiones* 254.13.

[31] Hyginus 1, *De condicionibus agrorum* 80.33.

[32] Hyginus 1, *cit.* 80.4–7.

[33] Hyginus 1, *De generibus controversiarum* 94.25–7. Cf. also Siculus Flaccus, *De condicionibus agrorum* 104.34–106.13, 17–18, 108.20–1, 26–7, 114.34; Agennius Urbicus, *De controversiis agrorum* 20.16–21, 30.31–3, 34.19–21, 36.11–12, 40.4–6, 42.10–13.

adjudicated, in which case they provided an initial assessment,[34] or as part of the adjudication process, on request of the person appointed as judge. Surveyors acted as main adjudicators principally in private disputes. Authors in the *Corpus* recommend caution, however, because, while disputes *de loco* seem to have standardly required the surveyor's intervention,[35] in some disputes *de modo* their intervention had to be complemented by other authorities, depending on the length of possession of a piece of land.[36] In general, surveyors seem to have been required above all when it was necessary to measure something, to read a map or to identify boundary markers. When assessing ownership through gift of land by emperors, however,

> the normal legal process has more weight than the surveying profession. For litigation begins under the condition in which ownership, not the site, is at issue. Surveying reveals nothing more than the site according to the map. So, in this dispute the surveying profession has second place since the way should be left open for another to decide first if a survey needs to be conducted.[37]

Again, according to Hyginus 1, the size of the *limes* must have a certain width not as a result of the survey but because of the law, while according to Agennius Urbicus there may be debate between surveyors and legal experts about how exactly the measurement for an allocation is to be made.[38]

Occasionally, the contrast between surveyors and other possible adjudicators is characterized epistemically, in terms of the different forms of knowledge involved. Hyginus 1 juxtaposes the *prudentia* of the law and 'our' *professio*; Agennius Urbicus does the same with the power of oratory, typical of jurisprudence, and the power of reflection of the surveyor who is trying to detect the layout of boundaries.[39] More generally, the *ars* of surveying is characterized as bringing about rationality, truth and (to use a modern term) objectivity. Frontinus refers to the surveyor's imposition of a geometrical grid on a piece of land as a restoration of the 'truth' of the place.[40] Hyginus 2 grounds a fundamental component of the surveying art,

[34] Frontinus, *De controversiis* 4.11–15, 8.10–13.

[35] Agennius Urbicus, *De controversiis agrorum* 36.13–15; see also 36.17, 40.33–42.2, 46.1–4.

[36] Agennius Urbicus, *De controversiis agrorum* 32.14–16, see Campbell 2000 commentary *ad locum*; cf. also Hyginus 1, *De generibus controversiarum* 96.4–10.

[37] Agennius Urbicus, *De controversiis agrorum* 36.25–8. Cf. also Frontinus, *De controversiis* 6.2–4, 8.3–4, 9–10, 12–13; Hyginus 1, *De generibus controversiarum* 98.37–100.3.

[38] Hyginus 1, *De condicionibus agrorum* 76.4–5 and Agennius Urbicus, *De controversiis agrorum* 40.19–20, respectively.

[39] Hyginus 1, *De generibus controversiarum* 96.4–10; Agennius Urbicus, *De controversiis agrorum* 26.4–7, 46.19–48.3.

[40] Frontinus, *De arte mensoria* 12.3–15; Cuomo 2000b; Weeks 2004. See also Agennius Urbicus, *De controversiis agrorum* 44.3–4.

namely the laying out of *cardo* and *decumanus*, in nothing less than the heavens and the order of the universe. He adds that, as well as easy to use, proper centuriation produces beautiful maps and 'the marking out of the fields themselves is attractive'.[41]

In sum, the knowledge of the land-surveyors when it came to dealing with disputes, was characterized epistemically as a reading of signs, supported by mathematical knowledge, and in terms of practice as a complex negotiation between old and new, pre-Roman and Roman, natural and artificial, general rule and individual case. Some of its features will remind the reader of the characteristics of medicine as a *techne* that we outlined in chapter 1. Moreover, the surveyors operated in a situation that, while not a marketplace of the kind we find with the Hippocratics, was competitive. It was not taken at all for granted that the resolution of a dispute required technical expertise. A case had to be made, and was made strongly by the practitioners themselves, that surveyors were better than lay people at identifying markers, reading maps and measuring areas, and that they were better than the general public, and at least comparable with the repositories of legal authority, in terms of their moral fibre and trustworthiness.

THE INSCRIPTIONS

The outcome of many a public dispute was publicly advertised – some inscriptions relative to private controversies have survived,[42] but the majority of what is extant records cases involving entire communities. Because many disputes between private individuals were likely to use surveyors as adjudicators, what has survived may give a biased, diminished reflection of their actual role. Not all decisions about land disputes were inscribed: turning the decision into a monument, a piece of public writing, was a deliberate and thus significant choice. Moreover, not all inscriptions reporting decisions about land disputes specify how the decision had been arrived at. The absence or scarcity of details is again often itself the result of a choice, and thus (again) significant for our historical interpretation.

[41] Hyginus 2, *Constitutio limitum* 134.5–6. He is aware, however, that it may not be possible to follow the system entirely because of arduous terrain, and that a completely reversed system, with the *decumanus* running north–south and the *cardo* east–west (the opposite of their normal directions), may be set in place: *ibid.* 144.10–22, cf. also 146.9, 152.28, 152.24–154.16.

[42] E.g. Arangio Ruiz and Pugliese Carratelli 1955.

In general, using inscriptions as evidence carries a number of problems: their survival is haphazard, so what we have is not entirely representative; many inscriptions are fragmentary or illegible; the slabs they are written on are often recycled so that their original context cannot be reconstructed.[43] With these qualifications in mind, let us proceed to analyse the inscriptions recording disputes from Trajan and Hadrian's time. They total forty, and exhibit great variety. I will analyse three sets of inscriptions at close range, so as to give the reader an idea of the material and of the problems of interpretation involved.

The Delphi case

The town of Delphi was involved in several boundary disputes with neighbouring communities to the east (Antikyra and Ambryssos) and the north-west (Amphissa and Myania). Some of these disputes are documented in three bilingual inscriptions, in Greek and Latin,[44] by Caius Avidius Nigrinus, who had been appointed *legatus pro praetore* (an imperial commissioner with judicial powers) around AD 111, after covering several important positions, including consul in 110. At some point after 114 Nigrinus went to Dacia, taking over the governorship of the province, only to be replaced after a few months. He later allegedly got involved in a plot against Hadrian, and was assassinated in 118.[45]

The first inscription, explicitly mentioning Nigrinus, dates from 14 September AD 110 or 114, and recounts how the communities of Delphi and Ambryssos had already submitted a boundary controversy to the emperor in the past. The case had been adjudicated by Cassius Longinus, using the services of a land-surveyor, Valerius Iustus. Longinus can be identified with Caius Cassius Longinus, consul in AD 30 and mentioned by several sources as an expert in the law.[46] Nigrinus restates the validity of Iustus' assessment of the situation, 'since the authority of what has been decided should always be preserved'.[47] At the end of the inscription, four people are listed as advisors to the legate: Quintus Eppius, Flavius Arrian (perhaps the same as the author of the *Anabasis* and later governor of

[43] For a summary of the debate about the use of inscriptions in ancient history, see van Nijf 1997: 23–8.
[44] Plassart 1970: nos. 290–9 (dating at c. AD 114); Rousset 2002: 91–108, 143–7 (dating at c. AD 110).
[45] Plassart 1970: 39; Oliver 1973; Eck 1983: 187n. 49; Syme 1988: 24–5; Birley 1997: 86–7.
[46] E.g. Hyginus 1, *De generibus controversiarum* 90.25–6: Cassius Longinus, 'a very wise man and legal expert'. Cf. Plassart 1970: 42.
[47] Rousset 2002: nos. 7–8. There is a lacuna in the text: according to Plassart 1970: nos. 290–1 it says that neither community had rejected the original decision, while Rousset 2002: 92, 149, thinks that the original referred to both communities ignoring Longinus' decision.

Cappadocia),[48] Caius Papius Habitus and Titus Livius. The group includes Romanized Greeks, and may be a cross-section of the local cultural and political elite.

The second inscription concerns a dispute between Delphi on one side and Amphissa and Myania on the other. The date is 19 September, presumably of the same year; the location is given as Elatias, possibly part of an official tour or an assize circuit. Although not specified in the surviving text, it is legitimate to assume that Nigrinus is again the narrating voice. He again confirms a previous decision, taken in 191 BC by the *hieromnemones* (officers in charge of sacred business at meetings of the Amphictyonic council)[49] and ratified by the consul Manius Acilius and by the Roman senate, according to which the borders were restored to what they had allegedly been since 337 BC. Indeed, the final part of the inscription, which details the course of the boundaries with reference to territorial markers, mentions an ancient boundary stone, engraved with a tripod and interpreted as a symbol of the god Apollo and thus of Delphi.

The third inscription, about the boundary between Delphi and Antikyra, is dated to 7 October, again presumably of the same year, and it explicitly names Nigrinus. He once again confirms the previous decision by the *hieromnemones*, in accordance, he says, with Trajan's indications.

The first thing to notice about the Delphi inscriptions is that they provide plenty of detail, and yet they do nothing but ratify decisions which had already been taken. This could be seen as an instantiation of an alleged universal Roman administrative principle, according to which officers promoted continuities with the tradition and pursued the restoration of a *status quo ante*.[50] Indeed, the authority of preserved collective memory here is undeniable. Nigrinus could refer to century-old settlements, written in stone and displayed in a very public place: the walls of the temple of Apollo.

In the second century AD, Delphi itself functioned as a large-scale memorial to the Greek past: travellers could admire the votive offerings and monuments set up to commemorate victories in athletic or poetic contests, and in the most important wars of Greek history. Pausanias' *Description of Greece* contains a minutely detailed catalogue of Delphic antiquities and of the stories, legendary or otherwise, associated with

[48] *Contra* Rousset 2002: 146–7.

[49] Augustus had reformed the traditional Amphictyonic council (instituted to look after the cult and temple of Apollo), by adding to the usual members (basically the main cities of Greece) new ones: Pausanias, *Description of Greece* 10.8.4–5. Cf. also Daux 1976.

[50] See e.g. Baldwin Bowsky 1987, Scuderi 1991.

them.[51] Several studies have exposed the complexity of the ways in which Greeks in imperial times strove to affirm and maintain their identity, through religion, literature and the strategic use of past events and traditions.[52] On the other hand, the preservation of a shared identity did not prevent individual communities from competing with each other for Roman patronage, or from fighting on several accounts, the determination of boundaries being one of them.[53] In fact, '[b]oundary maintenance [. . .] was one tactic by which a city could survive (or even flourish) under the changing conditions of the early empire', and disputes 'provided local elites with an arena for display, now they were denied former outlets such as warfare'. They played 'a major role in sustaining the social cohesion of a *polis*'.[54]

Nigrinus' regard for the past can be better understood if we consider that he found himself in a delicate position – a Roman, an outsider even if his family had friendship links with Greece, indeed with Delphi itself – called on to adjudicate a dispute between Greeks, in one of the places most sacred to Greek identity. Of the three controversies, the first, settled by Roman authorities and a (probably) Roman expert[55] and unsurprisingly ratified by Nigrinus, is perhaps the one that takes local sensitivities in the least regard. The second and third disputes had also already been settled, but this time by Greeks, although their authority had been validated by Romans. Nigrinus confirms the decision of the *hieromnemones*, but frames it with Roman stamps of approval: of the emperor, of himself, of the enquiry that he has conducted. Although no surveyor is mentioned, the whole episode is strikingly resonant of what we have found in the land-surveying treatises: while concessions are made to local lore, specialized knowledge is required for a reliable solution. Thus, the authority of the Greek council is presented as unable to stand on its own – it needs to be complemented by Roman expertise: the impartial listening to all parties, the thorough examination of all the available evidence, the dramatic discovery of old boundary markers. In the third case, the inscription specifies that the recovered *terminus* was written over in Greek characters. Although its antiquity points to a different period of Greek history, it is a Roman that brings it back to light, states its relevance, and declares it trustworthy evidence.[56] The position itself of

[51] Pausanias, *Description of Greece* 10.5.5–32.7.
[52] E.g. Jacquemin 1991; Swain 1991 and 1996; Alcock 1993.
[53] E.g. Robert 1977; Corbier 1991. [54] Alcock 1993: 118–19, 152–3.
[55] In some cases land-surveyors were sent directly from Rome, rather than recruited locally: Pliny the Younger, *Letters* 10.17b and 18.
[56] Plassart 1970: nos. 294–5.

the inscriptions is significant: Nigrinus has them set just below the earlier decisions of the *hieromnemones*, on the side of the temple of Apollo.[57]

Throughout, Nigrinus emphasizes his own role: that he enquires personally into the matter, listens to both parties, explores the areas in question, carefully weighs the relevant documentation. He underlines his entitlement to judge by appointment of the emperor, and the difficulty of the matter: the necessity of a careful examination, the problems caused by the antiquity of the debate, the time and effort it takes for him finally to ratify a century-old statement. The assumption is that he is the repository not only of political authority, but also of some sort of expertise; he can be relied on because of his character but also because of his know-how.

The Aizanoi case

A bilingual inscription set up as a frieze on the walls of the temple of Zeus at Aizanoi in Phrygia in perhaps AD 125/6, and a bilingual boundary stone found nearby, dating to AD 128, document a controversy adjudicated by the then proconsul of Asia, Avidius Quietus.[58] The parties involved were the city of Aizanoi and the settlers cultivating allotments belonging to the temple. The course of events was probably as follows: in Hellenistic times king Attalus (maybe Attalus I, 216–198/7 BC) and king Prusias (maybe Prusias I, 198/7–183 BC) had given land which belonged to the temple of Zeus to settlers. The fiscal status of this land was either left unspecified at the time of distribution or was ignored or changed when the region passed under Roman control. In any case, we are told that a dispute concerning rent from the allotments had been going on between city and settlers for a long time. Probably around AD 119/20, Mettius Modestus, then proconsul of Asia, had decreed that individual lots were indeed subject to tax. Avidius Quietus now declares his intention to solve the question once and for all, especially since the emperor Hadrian, whose humanity – we are told – so well combines with his sense of justice, has taken a personal interest in the matter. The final decision is that the settlers must pay up: this is tactfully presented as a benefit for the community, the triumph of peace over strife. But, concretely, how much tax should be paid? Given that the rent is proportional to the amount of land, one must calculate exactly how much land each settler is cultivating. As in many distributions, the original

[57] Plassart 1970: 38.

[58] Laffi 1971, on whom I depend for *prima facie* interpretation; Kokkinia 2004. Quietus was probably a cousin of Avidius Nigrinus.

allotments were probably all of a standard size, and regulations prevented them from being divided up, so that every property in principle should still be of that standard size or, at most, a multiple thereof. Yet at Quietus' time no standard unit was discernible.

To the main decision, in Greek, Quietus appends copies of letters in Latin which document his attempt to solve these technical problems. First the emperor decrees that Quietus should look at land allotments in neighbouring cities, and choose a size (*modus*) which is average (*nec maximus nec minimus*) with respect to the units in use in the area. Quietus delegates this task to an imperial procurator, Hesperus, telling him to provide 'expert' surveyors, probably locals.[59] Hesperus may have been himself a local surveying expert, both because Quietus asks him for help, and because he uses the technical term *renuntiare* to denote the communication of the result of an official measurement. Indeed, the procedure suggested by Hadrian and followed by Quietus corresponds rather closely to indications we have found in the technical treatises.

The boundary stone, in Greek and Latin, opens with a long titulature and testifies that the borders between the temple of Zeus and the city of Aizanoi, given by Attalus and Prusias, have been restored thanks to Septimius Saturninus, a former *primipilaris* (senior centurion). Saturninus may have been again a surveyor, this time with the army.

As in the Delphi case, we have here quite a complex and conflictual situation. The attitude to local realities is again rather sensitive: the inscriptions are bilingual; local people seem to have intervened; continuities are established with the pre-Roman past. Nonetheless, the new decision – which implies new or renewed economic demands – has to be made palatable. Quietus' strategy is to employ a rhetoric of public benefit and peace and to invoke a whole constellation of Roman or Rome-sanctioned authorities, from the humane emperor to the zealous procurator to the expert surveyors. The resolution of the debate is equated with the outcome of a technical problem: finding a 'golden mean' from among the many sizes available – the eventual average *modus* must have been a compromise in more senses than one.[60]

[59] A procurator was an employee of the emperor, perhaps in charge of the administration of an imperial estate. For what I call 'experts', in the Greek version of his letter Quietus uses the term ἐπιτήδειους (appropriate for the task), while in his letter Hesperus says '*qui usu sunt eorum periti*', which suggests, in my view, that they were local or at least familiar with local use.

[60] See Kokkinia 2004: 50–3.

The Daulis case

Two documents in Greek were inscribed on the same slab, found at Daulis in Phocis.[61] The longer text, dating AD 118, concerns a dispute *de loco* between the people of Daulis, represented by two men, and Memmius Antiochus, a private landowner. Although the contention is about who owns what portion of several tracts of land, variously cultivated, the person assigned to the case, T. Flavius Eubulus, calls himself a 'boundary man'. The background to the dispute can be reconstructed thus: Antiochus accused the people of Daulis of encroaching on his land and asked, or both parties asked, the proconsul Cassius Maximus to adjudicate between them. It is some indication of the slowness of the whole process that Cassius Maximus appointed Eubulus as judge; another proconsul, Valerius Severus, made him guardian and a third proconsul, Claudius Granianus, bid him take a decision. Eubulus' solution was to assign numerically definite portions, including a large part of a valuable olive grove, to Antiochus, and whatever was left over to the people of Daulis. He also specified that no bad-quality land should be included in the measured portion. Although we do not know how large the fields were to begin with, Eubulus' verdict seems to have favoured the landowner. In terms of procedure, he claimed to have listened to both parties and inspected the areas personally. He also mentions that Antiochus had bought a portion of the olive grove: evidence for the sale would have been in the form of a written contract or of witnesses' testimonies; either way, Eubulus may have possessed some legal skills. Technical ability of some kind is implied by the distribution, which specifies the starting point for the measurement and involves accurate operations.

The shorter, later inscription is about right of way and about the olive grove again; the parties involved this time are two archons (city magistrates) of Daulis, and Serapias – probably Antiochus' heiress – who acts through a representative. The stipulation of the first inscription is reversed: the size of the portions of the olive grove is the same, but the first choice of 435 *plethra* is given to the people of Daulis, with the remainder going to Serapias.

It is worth noting that, in the first case, the decision is officially delegated to one individual, Eubulus. He sounds like a Greek with Roman citizenship, as does Memmius Antiochus, while the city representatives Zopyrus son of Aristion and Parmenon son of Zopyrus have completely

[61] *IG* 9.1.61.

non-Romanized names. Of the signatories at the end of the first inscription, two, including Eubulus, have Romanized Greek names, one (Cassius Martianus) a completely Latin name and the remaining eight have Greek names.[62] On the other hand, the second case is adjudicated by a number of people, who, while showing some familiarity with technical matters – they decree that a map should be engraved for future reference – are not presented as boundary-men or experts of any kind. Rather, the presence in the list of signatories of people from nearby Antikyra and Tithorea harks back to the classical and Hellenistic custom of inter-city arbitration. Three out of twelve people on the second list have Romanized Greek names. It is perhaps not surprising that the judgement in the latter case inclines towards the people of Daulis.

Technical matters (accurate measurements, making a map) are presented as determinant in the resolution of both disputes. Either the people involved must have been knowledgeable about surveying themselves, or they must have been able to secure the services of someone who was.[63] The main contrast between the two inscriptions is in their different distributions, not simply of land, but also of authority. As in the Delphi texts, they are quite revealing of complex Roman/Greek equilibria, and possibly of the leverage of gender in legal contexts. In the shorter inscription, Greeks are judging the entitlement of a woman against that of a whole community, with hardly any Roman authorities in sight. In the case of Memmius Antiochus v. Daulis, a whole constellation of Roman proconsuls is invoked, and (Titus Flavius) Eubulus flashes one entitlement after the other – judge, boundary-man *and* guardian – to reassert both his political and technical credentials.

The three cases we have considered give an idea of the range of complex interactions between the three main figures of authority involved in a land dispute: surveyors (repositories of technical knowledge), imperial officers (embodying political power and to some extent legal knowledge), and the locals, the bearers of collective memory, of 'insider' knowledge.

In the next sections I would like to change perspective, and try and provide a more general, if inevitably simplified, view of how these sources of authority operated and interacted.

[62] Zopyrus (possibly a Persian name) must have been a very common name in Daulis – Serapias' representative in the shorter inscription is also called Zopyrus.

[63] My candidate would be Cassius Martianus from the first inscription: his name appears at the end of the list of signatories, just like the name of the surveyor in the Heraclea boundary settlement, see Uguzzoni and Ghinatti 1968.

CLUES

Can we identify general trends in the way land disputes were solved, at least in the period under examination, i.e. limiting ourselves to our sample? I think we can, but before I present my conclusions, I would like to offer my analytical tools to the reader's scrutiny. I said earlier that describing the outcome of a land dispute was a choice, and that the emphasis of the epigraphic description of some things rather than others, was also a choice. Mostly, these choices were about which source of authority, of the three I have listed, was privileged, and which downplayed. I think inscriptions about land disputes contain clues suggesting the prevalence of one or another of these viewpoints. Let us review these clues.

The locals

Some documents show a consideration of local customs, local authorities and local knowledge, because they pay attention to previous settlements, witnesses, and extant ways of demarcating or defining the territory.[64] These inscriptions will tend to provide details about the procedure followed to resolve the debate; they will use a rhetoric of care and thoroughness in taking the decision, and try to establish continuities with the past. They will also often be bilingual, a possible acknowledgement of accountability with regard to the local populations.

Three documents, all from the Eastern provinces, display this emphasis on local authorities and viewpoints. The first is a set of inscriptions relative to the people of Histria (Istros) in Moesia: a boundary settlement in Latin, by Manius Laberius Maximus, *legatus Augusti pro praetore* c. AD 100; various letters in Greek by Roman legates from the first half of the first century, confirming fishing rights or the right of use of a wood and, finally, a decision, again by Laberius Maximus and in Latin, about a local contractor's claim. The boundary in the first document is described by means of territorial markers (rivers, a ridge, a stream) bearing local names, and one of the Greek letters mentions the 'ancestral boundaries' of the Histrians.[65] A similar appeal to the past is found in an inscription, cut in the rock on the island of Markos in Nubia, dating to AD 111, and relative to a boundary settlement between two local populations.[66] The author, L. Lukeios Cerealis, head of the first equestrian cohort of Lusitanians, says that he drew on 'the sacred book', which could be an Egyptian text. References to

[64] Cf. Scuderi 1991: 382, 408. [65] *SEG* 24.1108–9, see Oliver 1965. [66] *SEG* 30.1980.1781.

Roman authorities are also present: Cerealis took into account previous decisions by Roman officers, and, while the emperor Trajan is mentioned, appeal is made to the geographically closer authority of the prefect of Egypt.

Again, a Latin inscription from Thessaly documents a boundary settlement between the people of Doliche in Thessaly and those of Elimiotis in Macedonia; the year is AD 101.[67] The text is an authenticated copy, conveyed by Caelius Niger, of the decision of Verginius Publianus, appointed judge by Trajan.[68] A boundary had already been established by Amyntas III, father of Philip of Macedonia and grandfather of Alexander the Great; his decision had been displayed in the forum of the people of Doliche in the past. As in the Delphi case, a Roman adjudicator, Publianus, ratifies that previous decision: a show of respect for local authority but also a Roman stamp of approval on the remote Greek past, and an attempt to forge continuities with it.

The imperial officers

The presence of political authority is a given in basically all inscriptions relative to land disputes, but it can be especially emphasized by elements such as a particularly long titulature (the emperor's name accompanied by *all* its titles), lots of detail about who appointed whom, plenty of Roman names with relative titles. On the other hand, shorter inscriptions can convey a similar message – if explaining oneself is an acknowledgement of accountability, the contrary is suggested by stating one's decision unmediated and unmitigated by further argument. Shorter inscriptions reveal that the stronger a political authority is, the less it needs to be cushioned by explanations.

Our sample includes four inscribed stones, in Latin, marking the boundary between Moesia and Thracia and datable to AD 136.[69] They mention a M. Antius Rufinus[70] who acted on the authority of Hadrian. The emperor's titulature is quite lengthy, occupying two-thirds of the extant inscriptions. We have an extensive titulature in another boundary settlement, documented by a very damaged inscription, found near Kroushograd and

[67] *AE* 1913.2, see Wace and Thompson 1910–11. Cf. also *SEG* 39, 577.
[68] Wace and Thompson 1910–11 read it as meaning that Caelius Niger kept the *commentarius* which contained the decision. A similar procedure described in Oliver 1965.
[69] *CIL* 3.749, 3.12407, 3.14422[1], plus p. 992, note to 749.
[70] If 'Antius' stands in for 'Antonius', he could be identified with M. Antonius Rufinus, who was consul in AD 131 (according to the *CIL*).

dating to AD 114.[71] The procedure is not specified, but the relevant chain of authority is from judge, C. Tyrannius(?) Priscus, to proconsul, to emperor, complete with several imperial titles and the names of the consuls for that year. Another unusually long titulature is found at the beginning of an AD 137 inscription found at Er-Rahel in Africa Proconsularis and establishing boundary markers.[72] No procedure is specified, apart from an appeal to the authority of the emperor Hadrian ('son of the divine Trajan Parthicus, grandson of the divine Nerva') which also conveys the best wishes of his son Aelius. The author of the settlement, C. Petronius Celeris, imperial procurator, turns up in another inscription about (probably) provincial boundaries for the people of Numidia, dating to AD 137, found at Guerria in Mauretania.[73] Again, no procedure is specified, but at least mention is made of Hadrian's benevolence (*indulgentia*).

The authority or command of the emperor, complemented by the intervention of various officers, is invoked in a Greek inscription, recording the boundary settlement between Dorylaeum and Nicaea, and dating to some time between AD 128 and 130;[74] in a group of Greek inscriptions from Ephesus, mostly fragmentary, regarding boundaries between the land of the temple of Artemis and neighbouring territories;[75] in a Macedonian inscription from AD 114;[76] in two markers, datable to around AD 100 and to AD 116, respectively, found at Ksar Gurai, near Thevesta in Africa Proconsularis, and relating to the Musulamii.[77]

On the even shorter side, we have a Latin inscription about the boundary between two communities in Macedonia in AD 101, found on the local mount Olympus;[78] a boundary marker between three communities in Spain from Hadrian's time;[79] another Latin inscription from Hadrian's time, about the boundary between the people of Philippi and an individual whose name has not survived;[80] and quite a few documents from Africa Proconsularis: two boundary stones, dating AD 116/17, found near lake Chott-el-Beida[81] and above all a group of inscriptions from around Madaura mentioning L. Minicius Natalis, who was *legatus pro praetore* around AD 104/5. They include a marker, now in the countryside but

[71] *AE* 1965.206. [72] *CIL* 8.21663 = *ILS* 5963. [73] *CIL* 8.8813, 8814 = *ILS* 5960.
[74] *AE* 1938.144. The dating is based on Aichinger 1982: 197. See also Groag 1939: 66–7.
[75] Meriç *et alii* 1981: nos. 3501–12. Number 3511 and 3512 can be assigned to around AD 111/12.
[76] *SEG* 24, 486.
[77] The first marker, *CIL* 8.10667 = *ILS* 5959, possibly announces a rearrangement of boundaries. The second marker, *ILAlg* 1.2939 bis, separates imperial property from Ammaedara and the Musulamii. In neither case is procedure specified.
[78] *CIL* 3.591 = *ILS* 5954. [79] *CIL* 2.2349 = *ILS* 5973 (see *ILS* vol. 3 p. clxxxvi).
[80] *CIL* 3.14406d. [81] *ILS* 9380/1.

originally possibly set in an urban context, indicating the boundary between the people of Madaura and the Musulamii;[82] a marker found on a local mountain, to indicate the boundary between the people of Madaura and another community whose name is lost;[83] a numbered marker (number 90) indicating the boundary between the Musulamii and the estate of a private landowner, Valeria Atticilla;[84] and finally, a marker, inscribed in the rock on the same local mountain, indicating again a boundary settlement between the people of Madaura and the Musulamii.[85] In the same location as this latter, another inscription to the same purpose mentions L. Acilius Strabo Gellius Nummus, also *legatus pro praetore* under Trajan, but in AD 116/17. None of these documents specifies resolution procedures; they all briefly appeal to the authority of the emperor. Only the inscription concerning Valeria Atticilla contains a rather long titulature, and concludes thus: 'A P P(*edes*?) 116, 400'.

The short inscriptions from Madaura offer more information as a group than individually: they testify to the continued attempts on the part of the Roman government to regulate the territory and consequently the movements of semi-nomadic populations such as the Musulamii, and to the fact that some officers (Natalis or indeed Nigrinus) may have been specifically charged with the land administration of certain regions. In contrast with the results of Nigrinus' intervention in the area of Delphi, no real account is given of Natalis' decisions. They are stated in concise form, and displayed in rural or mountainous, rather than urban, contexts. No local authority or tradition is recognized – the Roman stamp, as was the case with surveying and division in Republican times, is impressed unmediatedly upon the North African territory.

The technicians

The presence of surveyors, and the reliance on their expertise, is signalled by references to knowledge that we know to be specific to them: mathematical measurements and calculations, use of instruments, production or reading of maps or of signs and numbers on the boundary markers. Sometimes, the *mensores* themselves are named.

For instance, a Latin inscription from Hadrian's time documenting a boundary dispute between Lamia in Thessaly and the neighbouring community of Hypata in Macedonia mentions not only the adjudicator, the proconsul Q. Gellius Sentius Augurinus, but also Julius Victor, a surveyor

[82] *CIL* 8.28074. [83] *CIL* 8.4676. [84] *AE* 1923.26. [85] *CIL* 8.28073 = *ILS* 5958a–b.

and veteran he employed.[86] Augurinus says that he inspected the matter personally over several days, in the presence of representatives of the two cities; the boundary is described with the help of territorial elements, including a named mound and what sounds like the grave of a local notable or hero ('*monimentum Euryti*').[87] The markers are probably local, perhaps linked to the history and religious customs of the place, but they are once again ratified and, as it were, re-written by the combined intervention of Roman ex-soldier and Roman proconsul. The emphasis is on the chain of political authority aided by technical expertise – *mensor*, proconsul, and of course emperor – rather than on any collective memory of the place: Julius Victor goes down in stone, the local representatives are left unnamed.

The intervention of another, named, surveyor is recorded by an inscribed stone, found at Ou-Mendas near Henchir-Moussa in Africa Proconsularis.[88] The *termini* between two local populations, which originally were due to C. Tullius Capito Pomponianus Plotius Firmus, consul in AD 84, have been restored by order (N.B. not 'authority') of Hadrian through (*per*) Peregrinus, imperial slave and surveyor.

Less direct evidence of surveying contributions can be read in signs and numbers. An example is that of two boundary markers, one found in Macedonia and separating the public land of the colony of Philippi from that of a private individual, Claudianus Artemidorus;[89] the other relating to the border between Thracia and the community of Thasos.[90] Neither specifies procedure, both invoke the authority of Trajan – the latter is a numbered marker ('*terminus secundus*'); the former concludes with the letters *S P C*, whose interpretation is uncertain, but which may constitute a fine example of the *signa* for whose production and deciphering a surveyor's skills were required. A group of inscriptions, found cut in the rock on mountains around Byblos in Syria and datable from at least Nero's to Hadrian's time, contain again numbers, coded letters and a reference to trees.[91]

More in this category from Africa Proconsularis: we have a group of boundary markers, most of which were re-used already in ancient times, found near Henchir Chenah and on mount Djebel Stiah. Some of them are from Augustus' time, but at least one bears Trajan's titulature; several record names of legates, one of them a member of the third legion.[92]

[86] *CIL* 3.586, cf. 1230 = *ILS* 5947a, also in Smallwood 1966. See also Doukellis 1988; Moatti 1993 annexe V.
[87] *CIL* 3.586, 8. [88] *AE* 1942/3.35. [89] *CIL* 3.14206[4] = *ILS* 5981.
[90] *AE* 1968.469 = 1992.1533. [91] *CIL* 3.180 (cf. p. 972).
[92] *CIL* 8.22787, part of the same group as *CIL* 8.22786, 22788, 22789.

Many of the markers are numbered to indicate orientation with respect to *decumanus* and *cardo* or number of *centuria*; the one from Trajan's time seems to refer to a map – all indications of an expertly surveyed territory. Markers found near Kroub[93] and at Sigus[94] establish the distribution or donation of land to the people of Cirta, and separate it out from public land. No procedure is specified; Hadrian's authority is invoked; some of the stones are inscribed with the letters *A P C*, which can be read as '*Agri Publici Cirtensium*'. It has to be noted that there are several other markers in the area, some of which cannot be dated with certainty, and which also bear letters: *A P C*; or *A P C* on one side and *A A M* ('*Agri Attributi Milevitanis*'?) on the other; or *A P C* and *A A C* ('*Agri Accepti Cirtensium*'?);[95] or *A AG SAP*.[96] A boundary marker between the people of Igilgili (Djidjelli) and the Zimizes, dating AD 128, establishes not only the border between the two, but also that the Zimizes are no longer allowed to use a cistern or reservoir (the *castellum Victoriae*) found along the border, whose perimeter is given with the specification that the measurement starts from the wall.[97] Neither procedure nor emperor are specified; the only authority invoked is that of M. Vettius Latro, imperial procurator.

And I could go on:[98] much undated material from Africa Proconsularis hints at the intervention of technicians, who may have ranged from members of the army – there are several mentions of soldiers or decurions carrying out the operations – to nominal members of the extended imperial household. We have for instance a marker indicating the boundary between the Thabborenses and the Thimisuenses (found at Henschir Zoubia) and mentioning the intervention of a centurion, who followed a military (?) map ('*formam* [*mar*]*tianam*'),[99] and a set of markers found on mount Djebel Cheïdi, of which fifteen, mostly numbered, indicate the borders between the city of Thugga and an imperial estate. Three of them refer to Tiberinus, an imperial freedman and 'head of the surveyors'; the

[93] *CIL* 8.7084/7085 = 19431/19432, plus *CIL* 8.7088, which is very fragmentary and may date to either Trajan's or Hadrian's time.

[94] *CIL* 8.19104 = *ILS* 5978.

[95] *CIL* 8.7086, 7087, 19329, 7089, 18768.

[96] *CIL* 8.7090. Cf. also *CIL* 8.19132 = *AE* 1939.160, *CIL* 8.19133 = *ILS* 5977, *CIL* 8.19134 = *ILS* 5977a, all boundary markers found at Sigus, dated c. AD 138 and bearing various combinations of letters.

[97] *CIL* 8.8369 = *ILS* 5961.

[98] For more instances of encoded signs, including numbers, on boundary stones see e.g. *CIL* 8.25366, *CIL* 8.25988, *CIL* 8.27563, *CIL* 8.7086, *CIL* 8.7087, *CIL* 8.7089 = 8211 = *ILS* 5980, *CIL* 8.18768 = 10821 = *ILS* 5979, *CIL* 8.19329, all not dated; among dated inscriptions are *AE* 1923.26, *CIL* 8.8.7090, *CIL* 8.19104 = *ILS* 5978.

[99] *CIL* 8.23910192. Military men employed also at e.g. *CIL* 8.22765 = *ILS* 8923, c. AD 263 (soldiers stationed at the border), *CIL* 8.23395 = *ILS* 5966 (an imperial reservist), *CIL* 8.8811 = 20618 = *ILS* 5964 (a decurion), *CIL* 8.9755 (a centurion), the three latter are not dated.

others have formulae such as 'Caes N S(altus?) F(undi?) R G'; in at least one case the name of the city is drastically abbreviated.[100]

The noticeable presence of technical expertise is not incompatible with that of other forms of authority. The need for negotiation between the knowledge of the surveyor and that of the locals had been amply recognized in the *Corpus*. For all of the treatises' conciliatory approach, it seems that technical authority, which deployed a whole rhetoric of reliability and objectivity, could be used to impose new ways to the detriment of old ones. Especially the North African documents seem to indicate a super-imposition, when not a complete obliteration, of any pre-existing traditions or decisions. Local participation in decisions is never mentioned; the brevity itself of many of the documents suggests that not many concessions were made to a rhetoric of justice or imperial forethought. What is more, political authority itself seems sometimes mediated by the delegated experts. On some occasions, the inscription appeals directly to the authority of an officer; several times people of a status lower than legate are employed in the settlement of boundaries: we have people identified as procurators (unsurprising, given the large number of imperial estates in the province), freedmen and even slaves. In contrast to that, the general impression from the Greek-speaking provinces, especially Achaea, is that an effort was made to create a continuity with preceding traditions of land settlement; some appearance was given of listening to the representatives of the local communities, and local arbitrators were sometimes used.

CONCLUSION

Of the various methods for resolution of land disputes available in antiquity, *demonstratio* was based on inter-personal relationships, and presupposed a close-knit community, where one's reputation, mostly a function of status, birth, antiquity of the family, was key. Trust was in a sense guaranteed by the fact that it was in a person's interest to keep his word;[101] authority derived from his virtues, social position, connections, not from a special brand of knowledge he had been trained into. The quasi-cultic character of boundary markers, well documented since early times, taps into a related notion of trust based on religious authority: infringement of the social order was inseparable from the breaking of religious rules. Signs inscribed on *termini* may originally have had a ritual function, like curses or

[100] *CIL* 8.25988.
[101] See Millett 1991 for economic exchange based on the same principle.

amulets. Hence the *deus Terminus* and the severe penalties inflicted for disturbing boundary markers. Once again, we could say that trust was rooted in the sense of belonging to a community, kept together by its religious practices as well as by its respect of property. Inter-city arbitration worked on a multi-community level, but it again referred to a shared moral universe, comparable to the one underlying *xenia* relationships.[102] The only prerequisites for someone to be able to adjudicate a dispute were moral: fairness, disinterestedness, impartiality.

Even though inter-city arbitration already implied legal expertise (examination of evidence such as markers, contracts, inscriptions and testimonies), it is not until imperial Roman times that a different notion takes root: it takes some kind of special entitlement to be able to adjudicate land disputes fairly, indeed, to be able to adjudicate them at all. Sometimes, this entitlement is openly presented as political authority, derived from the senate or the emperor, and ultimately conferred through unequal power relations – something of which the literary and technical authors we have cited at the beginning were very aware. Sometimes, this entitlement is presented more in terms of expertise, of special knowledge, ranging from skill and thoroughness in examining the evidence, listening to the parties, spending whatever time is necessary on the case, to the more technical baggage of calculation, measurement, training, that distinguished the surveyor from the layman and the good surveyor from the bad one. These 'new' entitlements were necessary in a heterogeneous situation, that of the Empire, where shared moral universes had to be created, superimposed or reaffirmed, but could not be taken as already given.

New entitlements also imply new sources of trust: for the surveyor, as we have seen, a combination of the epistemic (the reliability offered by mathematics) and the ethical; for the imperial officer, an even more complex combination of political authority, legal knowledge, and moral qualities. Crucially, the adjudicator could *choose* to what extent to rely on local knowledge, or technical intervention. He could decide to deploy different mechanisms of trust, and I would argue that such decisions, taken by the various officers mentioned in the inscriptions, reflected their awareness of different local equilibria, and were a substantial part of what it meant to govern or administer the empire.

In contexts with strong urban traditions, long-standing land administration traditions, local culture which preserved the collective memory of places in ways that the Romans recognized (especially Achaea and Asia

[102] Ager 1996.

Minor), the policy seems to have been at least to put up a show of acknowledging local knowledge and local practices, and to combine political authority with the creation of continuities with the past.[103] Technical expertise, with its associated rhetoric of accuracy and fairness, seem to have been deployed in more urgently conflictual cases: for instance, at Aizanoi and Daulis, where economic motives are patent (whereas they appear secondary at Delphi).

On the other hand, in contexts without strong urban traditions, or long-standing land administration traditions, or with no traditions that the Romans would recognize as such, and with a hefty military presence, where large estates, including imperial estates, may have been encroaching on the territory of possibly nomadic populations, hardly any mention was made of local ways of relating to the land, and political authority, not even thinly disguised as legal expertise, seems to have been prevalent. Technical expertise was present, but in a different way. Notice the strong military connections, and the relative abundance of cryptic, semi-symbolic, coded evidence, along with the succinctness of the inscriptions themselves: surveying knowledge was indeed used but, as it were, not justified. The sense of accountability to the local community seems lacking; all that remains is the intervention of technologies for the modification of the landscape.

To get back to our original question, on the basis of our case-study one could in fact deny that technical knowledge played any significant role in the administration of the Roman Empire. The evidence that surveyors were major actors in the adjudication of disputes is scanty, and, when compared to the treatises in the *Corpus*, it shows a dissonance. If we took inscriptions to simply reflect reality, we may well end up branding the technical works as wishful thinking, or empty theories which did not correspond to actual practice.

My view is rather different. I think we can safely assume that surveyors were employed much more often than we find recorded, both because they may have played a bigger solo role in the private sector than they did in the public one, and because in the public sector they tend to be overshadowed by the imperial officers, who were, after all, often the commissioners of the inscriptions. This indicates a dialectic rather than an inconsistency with respect to the self-image the surveyors were constructing and promoting in their written works, and would fit well with the social contrasts we find expressed by the literary, non-technical, sources. In other words, one could provide a good reason why technical knowledge was not more visible, and

[103] Cf. Eck 1990.

one could provide a good reason why technical knowledge was more visible in some cases and not others, if the argument stands that in some provinces or situations the repositories of political power favoured the recourse to some sources of authority in preference to others.[104]

Representation is a question of viewpoints: the literary authors cited at the beginning depict technical experts mostly as guilty participants in the decline of humankind, but also as agents who needed to be controlled and regulated by moral and social virtues. If the arguments of the preceding chapters have been at all convincing, this should not come as too much of a surprise, and we can see a certain degree of continuity throughout antiquity as far as some views of technical knowledge are concerned. The surveyors, for their part, represented themselves as key players and agents of rationality, in tune with the *cosmos*, but also bound by the necessities of negotiating diverse customers and diverse masters. As for the inscriptions, the fact that they deal with administrative, technical matters does not imply that they are just a reflection of reality. They are the result of a choice – the choice of how to represent a certain event: whether or not surveyors were used more often than is recorded, their particular brand of expertise was *strategically* represented, as participating in the resolution of disputes in specific situations, or on the contrary, as elided or even, arguably, as appropriated by the relevant political authorities in order to elicit trust, achieve control or, in a strong sense, make a territory into a part of the Empire.

[104] I do not wish to overemphasize this point – as Brian Campbell rightly observes (personal communication) much more evidence is needed before one can tell precisely how parallel cases were dealt with in different parts of the Empire.

CHAPTER 5

Architects of late antiquity

The third-century historian Cassius Dio reports the following episode:

> [Hadrian] banished and later put to death Apollodorus, the architect, who had built the various creations of Trajan in Rome – the forum, the odeon and the gymnasium. The reason assigned was that he had been guilty of some misdemeanour; but the true reason was that once, when Trajan was consulting him on some point about the buildings, he had said to Hadrian, who had interrupted with some remark: 'Be off, and draw your pumpkins. You don't understand any of these matters.' [. . .] When he became emperor, therefore, he remembered this slight and would not endure the man's freedom of speech. He sent him the plan of the temple of Venus and Roma by way of showing him that a great work could be accomplished without his aid, and asked Apollodorus whether the proposed structure was satisfactory. The architect in his reply stated, first, in regard to the temple, that it ought to have been built on high ground and that the earth should have been excavated beneath it, so that it might have stood out more conspicuously on the Sacred Way from its higher position [. . .]. Secondly, in regard to the statues, he said that they had been made too tall for the height of the cella. [. . .] When he wrote this so bluntly to Hadrian, the emperor was both vexed and exceedingly grieved because he had made a mistake that could not be righted, and he restrained neither his anger nor his grief, but slew the man.[1]

Book 69 of Dio's *Roman History*, from which this story is taken, survives only as an eleventh-century epitome by the monk Ioannes Xiphilinus, who left out a large amount of the original material.[2] It seems significant, then, that the story of Hadrian and the architect, which does not put the emperor in a particularly good light, should have been selected for inclusion. Perhaps Xiphilinus was familiar with the sixth-century historian Procopius, whose work *On Buildings* also mentions Apollodorus:

[1] Cassius Dio, *Roman History* 69.4.1–6, Loeb translation with modifications. Historians agree that 'pumpkins' refers to scalloped vaults, like those much in use at Hadrian's villa at Tivoli. For Hadrian's interest in building see e.g. Aelius Aristides, *Speeches* 27.17–21. On the passage see MacDonald 1965: 132–6; Ridley 1989.

[2] This can be checked against books that survive in their original form, cf. Millar 1964: 2.

> The Roman emperor Trajan, being high spirited and active, seemed irritated that his kingdom was not unlimited, but bounded by the Ister river. So he was able with effort to span it with a bridge, so that he might be able to cross it and that there might be no obstacle to his going against the barbarians beyond it. How he built this bridge I shall not go to the effort of relating, but shall let Apollodorus of Damascus, the architect of the whole work, describe it.

In a work on building, this is the only time that Procopius uses the term *architekton*.[3]

Whether the story of his death is true or not, Apollodorus is symbolic of the relationship between architects and emperors. Monuments such as the temples of Venus and Roma were among the most tangible emblems of imperial power. At the same time, they were among the most sophisticated artefacts of antiquity; an aura increased by their uniqueness: unlike, say, statues, they were less easily reproduced.[4] The clash between Apollodorus and Hadrian can be seen as a debate about control of the technical product.[5] Hadrian is in a position to dictate the when, where and how much of a building, and to put his name, writ large, on the finished thing – and yet, he is keen to be seen as a competent architect. Apollodorus' comments sting because they remind the most learned of emperors that, despite his power, he will forever remain an amateur, subordinate in knowledge, if in nothing else.

A different negotiation of a similar conflict in Procopius:

> One of the arches [of the church of Hagia Sophia in Constantinople] [. . .] had already been built up from either side, but it had not yet been wholly completed in the middle, and was still waiting. And the piers, above which the structure was being built, unable to carry the mass which bore down upon them, somehow or other suddenly began to crack, and they seemed on the point of collapsing. So those around Anthemius and Isidorus, terrified at what had happened, brought the matter before the emperor, having come to have hardly any hope in the *techne*. And straightaway the emperor, impelled by I know not what, but I suppose by God (for he is not a mechanician), commanded them to carry the curve of this arch to its final completion. 'For when it rests upon itself,' he said, 'it will no longer need the piers beneath it.' And if this story were without witness, I am well aware that it would have seemed a piece of flattery and completely incredible; but since there are available many witnesses of what then took place, we need not hesitate to

[3] Procopius, *On Buildings* (henceforth *Aed.*) 4.6.11–13, Loeb translation with modifications throughout. Procopius never does tell us how the bridge was built, but there is plenty of detail in Cassius Dio, *Roman History* 68.13.1–6 – with no mention of Apollodorus. Cf. Millar 1964: 65.

[4] Taylor 2003: 10–12. Some monuments *were* reproduced, e.g. the Forum Augusti at Arretium and Emerita – I owe this point to Dominic Rathbone.

[5] Taylor 2003: 10–11. Some architects did sign their work in Roman times: Burford 1972: 21, 214.

proceed to the remainder of the story. So the technicians carried out the instructions, and the whole arch then remained stable, sealing by experiment the truth of the idea.[6]

The architects mentioned in the passage, Anthemius and Isidorus, were in charge of building a new, massive, church to replace the one that had been burnt down during riots in Constantinople. In marked contrast to Apollodorus, this story sees their *techne* subordinated to Justinian's superior – indeed, divinely inspired – knowledge. And this is not the only time when Justinian outdoes the experts: Procopius reports a similar scenario for columns flaking off again at Hagia Sophia,[7] for fortification works at Daras,[8] stone supplies at Jerusalem,[9] and even supplies in the North African desert, when the emperor is able to locate a source of drinking water.[10]

Apollodorus and Anthemius and Isidorus are almost mirror images: the expert who can reduce an emperor to anger and grief because of his superior technical knowledge, and the experts whose workforce is terrified and doubtful of their ability[11] and turns to the emperor's higher wisdom. What happened in the time between Hadrian and Justinian to change the relationship between architects and emperors? Which is part of the wider question: what happened to technical knowledge as the empire went from the second to the sixth century AD? Perhaps even more than in other chapters, answering those questions will require venturing into an immense ocean that remains largely uncharted: the history of the science and technology of late antiquity. With few exceptions, accounts of ancient technology peter out at some point around the third century AD, and late ancient studies, despite their flourishing over the last twenty years, have more or less completely ignored science and technology. This is all the more deplorable, since, as I hope to show, just skimming the surface of the late ancient evidence on science and technology produces rich results, and can provide invaluable insights into the culture of the time.

[6] Procopius, *Aed.* 1.1.67–73. On the difficulty of rendering the term *pessoi*, which is defined by Procopius earlier as 'piers' (1.1.37) but here from the context seems to mean 'props', see Mainstone 1988: 205.

[7] Procopius, *Aed.* 1.1.74–8: 'and the Emperor, in this way, enjoys a kind of testimonial from the work'. The idea that buildings are testimonials is found throughout the text.

[8] Procopius, *Aed.* 2.2.9: 'God provided the solution for the impossible problem (*amechania*).'

[9] Procopius, *Aed.* 5.6.16–21.

[10] Procopius, *Aed.* 6.6.9–12.

[11] The expression οἱ ἀμφὶ Ἀνθέμιον καὶ Ἰσίδωρον might simply mean 'Anthemius and Isidorus', but, given the context, I opt for 'those around Anthemius and Isidorus', namely the workforce referred to later in the text. I thank Daryn Lehoux and Heinrich von Staden for help on this point.

So, given that we still need ground surveys of the available sources, first I will assemble a group picture of architects in late antiquity. Secondly, I will consider whether this picture is significantly different from its equivalent for the earlier Roman Empire, and then attempt to account for any changes.

WHO WERE THE LATE ANCIENT ARCHITECTS?

I have deliberately not defined 'architect' up to this point. My survey aims to pin down a group, but also capture a variety of levels. To this end, I will take the liberty of drawing on sources relative to people who were called by various titles, my guiding criterion being that they all had specialized knowledge of building.[12] This was denoted by at least five terms in Greek: *architekton*, *tekton*, *mechanopoios*, *oikodomos* and *technites*. In Latin we have: *architectus*, *structor*, *faber*, *aedificator* and more. Despite the obvious existence of different levels, the terminology remains rather fluid. Indeed, there was no universally agreed usage for architectural technical terms either.[13]

Sometimes the sources allow us a glimpse of the interaction between different categories of builders. For instance, an inscription found beside one of the entrances of the theatre at Miletus reads:

> The builders (*oikodomoi*), Epigonus and company, contractors (*ergolaboi*) for the part of the theatre, of which the prophet of the god, the late lamented Ulpianus, was financial superintendent (*ergepistatei*) and the architect (*architekton*) Menophilus was contract-awarder (*ergodotei*), enquired whether they should execute the arching and the vaulting. And should they consider employment given by their native city or employment of some other kind. The god gave his oracle: for men of skill it is expedient to use sound constructions and devices together with the suggestions of the best man of good ability, while appealing with sacrifices to Pallas Tritogeneia and mighty Heracles.

The text records the workers' consultation of the oracle of Apollo at Didyma, and its interpretation is debated.[14] Were the workers striking against Menophilus – was he no longer on the scene for some other reason?

[12] On the problems of putting together a group picture of architects, see Eck 1997: 399. I will concentrate on the Greek/Eastern side of things, for which there seems to be more evidence from this period, and I will not consider Egypt because the papyrological evidence on this issue deserves separate treatment. On an earlier period I found DeLaine 2000 very inspiring.

[13] Downey 1946, 1946–8: *mechanopoios* indicates a higher level than *architekton* because of the theoretical import of mechanical knowledge; Lassus 1947: 262; Hellmann 1994; Di Branco 2000: 200–1.

[14] Donderer 1996: A 61 = Herrmann 1998: # 935, Engl. tr. in Parke 1985: 76–7, who dates it to Hadrian's time. Fontenrose 1988: 193–4, dates it to c. AD 120, Herrmann 1998: 122 to the end of the second/beginning of the third century AD. See also Buckler 1923: 34; Parke 1985: 77; Evans 1994: 153.

Did the oracle's response lead to the completion of the job,[15] and is the inscription a celebration of the fact that it was divinely sanctioned? As for our nomenclature question, and the corresponding hierarchy, the order seems to have been: architect, superintendent (not necessarily a technical expert), and *oikodomoi*, i.e. specialized workers, organized around a leading figure, perhaps called a *technites*.[16] But note how the architect's authority was far from unquestionable, and how the group of *oikodomoi* was working together on a stable basis, even enquiring into the possibility of finding work abroad, presumably as a group rather than individually.

Further evidence is in Diocletian's price edict (AD 301), where jobs such as stonemason, carpenter or cement-maker command twice the maximum wage of an unspecialized worker, but less than specialized marble workers.[17] Architects figure only as teachers: their time is worth half that of a *grammaticus* or a *geometra*, but twice that of a simple *magister litterarum*, and more than a *calculator*.[18]

Some of the professions in Diocletian's edict figure in a mosaic from Oued Rmel in Tunisia, possibly from the fifth century AD.[19]

The central medallion, still partly visible, contained an inscription, perhaps with the dedicatee's name. The bottom level depicts someone on a cart carrying a column – let's call him the unspecialized worker. In the medium register a cement-maker is mixing rubble and mortar. At the top, a figure, wearing a sort of toga and not directly engaged in the work, holds what appears to be a measuring rod. He is commonly interpreted as the architect. Next to him are an axe, a *gnomon*, perhaps a magnified plumb-line, a column capitol, and another person, probably a carpenter. The order in which a person entering the room was meant to read this mosaic starts with unspecialized worker at the bottom – the foundations. It continues with the cement-maker – the main structure – and culminates with architect, highly specialized worker, emblems of the profession and the top piece of a column. The arrangement of the Oued Rmel mosaic may thus have reproduced both the hierarchical division of tasks at the building-site, and the process of building itself.

As a final piece of evidence, Symmachus reports an illuminating episode that took place in Rome in AD 384, when he was city prefect.[20] Two senators had been put in charge of building a basilica and a bridge. This

[15] Works left unfinished were a concern, see e.g. *Codex of Theodosius* 15.1.3 (AD 326), 15.1.28 (AD 390).
[16] According to Donderer, but I am not sure the text warrants his reconstruction.
[17] The edict in Giacchero 1974: 150–1. [18] Giacchero 1974: 154–5. [19] Fantar 1994: 153.
[20] Symmachus, *Relationes* 25–6. I have already commented on this episode in Cuomo 2000a.

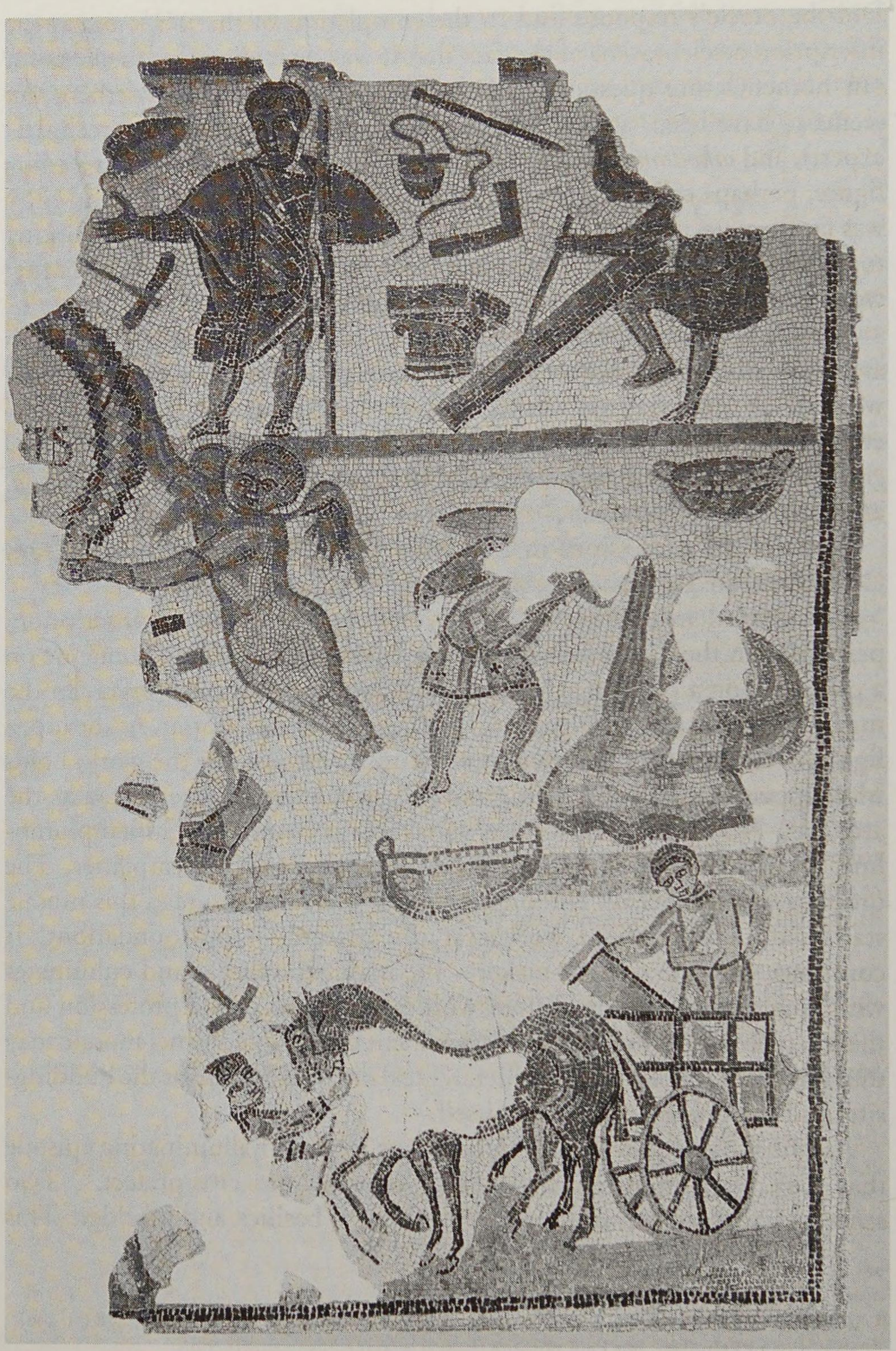

Figure 5.1 Mosaic of a building site, 2.32 m × 1.64: Musédu Bardo (Tunis), inv. A 264.

latter, however, turned out to have a structural defect. When the two main experts disagreed on what to do, and started accusing each other, the public enquiry into the matter had to find counsel elsewhere. External '*fabrilis artis magistri*' were asked for a technical assessment of the situation, while *artifices* involved in the construction of the bridge provided an estimate of costs. A diver also offered his – apparently unsolicited – opinion on a certain building procedure. We thus have different levels of expertise and authority: the top tier of the building community was involved in teaching – one of the two architects is characterized as a *professor* – and in at least some cases enjoyed senatorial status. While this may be linked to the decline in prestige of the senatorial class,[21] it is still quite significant and not necessarily an isolated case.[22]

To summarize, the world of the late ancient architect was rich and stratified, but difficult to pin down accurately for the modern historian. We could describe this group of practitioners as distributed along a spectrum, with humble, not very well-educated, relatively poor builders at one end and prestigious, theoretically sophisticated, relatively wealthy architects at the other. In what follows, I will offer the reader a few examples taken from this professional constellation, with the warning that further and more comprehensive analysis of the evidence, as always, is needed.[23]

To begin at the top, good representatives of a typical late ancient top-tier architect are Anthemius and Isidorus themselves. In Procopius' account, Justinian gathered *technitas* from all over the world, to be directed by 'Anthemius of Tralles, the most learned man in the knowledge called mechanics, not only of the people of this time, but also of those who had lived long before' and 'another mechanician, Isidorus by name, a Milesian by birth'. Their appointment to the task of erecting Hagia Sophia is presented as a sign of God's goodwill towards the emperor.[24] The two architects are also celebrated in a later description of Hagia Sophia,

[21] Cf. Brunt 1980: 82: 'over half the civilian architects attested epigraphically were slaves and freedmen'. That is definitely not the case in late antiquity.

[22] Another possible fourth-century example in Donderer 1996: A 10 = *IG* 3.4440, cf. Grégoire 1927–8: 467; Downey 1948: 111n. 3; Robert 1948: 74; Kuhoff 1983: 94; Dagron and Feissel 1987: 97n. 28; Feissel 2000: 97.

[23] I have made extensive use of Donderer 1996, which collects the epigraphic evidence from the Roman period for *architectus* and ἀρχιτεκτών; a review in Eck 1997.

[24] Procopius, *Aed.* 1.1.23–6. Notice that Anthemius is introduced as 'learned in the knowledge (*sophia*) called mechanics' not long after Procopius has said that 'the people of Byzantium call the temple Sophia, most appropriately inventing an epithet for God' (1.1.21). There has been some debate as to why Procopius feels it is necessary to explain the name: cf. Downey 1959; Cameron 1965.

composed for the dedication of the new dome (the original had collapsed after an earthquake in probably AD 558). Anthemius is attributed 'wise counsel' and called 'multi-resourceful' (*polymechanos*), and Isidorus, 'all-wise intellect'. Both are presented as subordinate to Justinian and Theodora in the building enterprise.[25] Anthemius, whose tasks are primarily geometric (centring the church and drawing its *schema*),[26] is praised by the emperor for his *techne* and *nous* when Justinian verifies that, despite the quake, the foundations of the church have remained stable.

With this in mind, it is intriguing that the other biographical information we have about Anthemius relates, apart from the fact that two of his brothers were doctors, his feats in mechanical trickery and his penchant for practical jokes. Apparently, he artificially produced very convincing earthquake- and thunder-effects in order to scare the rhetorician Zeno, who lived near him. Increasingly annoyed, Zeno complained to the authorities, and the case went in front of a magistrate. The dispute between the two neighbours is presented as a fight between words, the products of rhetoric, and wonders, the products of mechanics.[27] On a more scholarly note, Eutocius of Ascalona (sixth century AD) dedicated his commentary on Apollonius' *Conics* to a 'dear friend Anthemius', 'my dearest Anthemius'.[28] We know that Eutocius was an important cultural figure at the time, commenting on and editing the texts not only of Apollonius, but also of Archimedes, and that he was probably active in philosophical teaching.[29] If this is our Anthemius, Eutocius' friendly tone may be evidence not only for his possible inclusion in a network of mathematicians, mechanicians, architects and philosophers, but also that Anthemius was able to understand such complex material as the *Conics* (which remained complex even after Eutocius' elucidations). According to some, he may even be the author of a short text on mechanical paradoxes and of the last part of a mathematical text known as the *Fragmentum Mathematicum Bobiense*, where he referred to those who research mechanics as children of the Muses.[30]

Eutocius also appears to mention Isidorus of Miletus. There are references to him in the commentary on Archimedes' *Sphere and Cylinder*: that

[25] Paulus Silentiarius, *Ekphrasis* 550–5.
[26] Paulus Silentiarius, *Ekphrasis* 265–71; Macrides and Magdalino 1988.
[27] Agathias (AD 536–82), *Histories* 5.6–9. Anthemius' and Isidorus' contribution to the building of St Sophia at 5.9.4; cf. Darmstaedter 1933: 479.
[28] Eutocius, *Commentaries on Apollonius' Conics* 168.5, 290.3, 314.2, 354.2 (the address is repeated at the beginning of every book).
[29] Tannery 1912 [1884]; Westerink 1961; Decorps-Foulquier 2000.
[30] Heath 1906–7; Huxley 1959: reference at 25.

'our teacher the mechanician Isidorus of Miletus' collated Eutocius' present book, and that he described an instrument to draw parabolas in his commentary to Hero of Alexandria's book on vaults. The same allusion to a collation of Eutocius' work by 'our master Isidorus' is at the end of the commentary on Archimedes' *Measurement of the Circle*.[31] Isidorus, 'our great master', 'that very famous man', also appears in the so-called book 15 of Euclid's *Elements*, where he is ascribed a result on the inclination necessary for planes to form the five regular solids, demonstrated case by case.[32] That Isidorus devised an instrument to draw parabolas, and that he commented on a work on vaults is plausible, especially given the role conic sections may have played in architectural design and the notorious difficulty of drawing them. Yet, it is unlikely that Eutocius was both the friend of Anthemius, on what seem equal terms, and the pupil of Isidorus, who in Procopius and Paulus Silentiarius is presented as the junior person. Most likely, Eutocius was a friend of Anthemius of Tralles, his works circulated in that environment and were later collated by Isidorus of Miletus, a pupil of whom then interpolated the references we now have in Eutocius' text.[33] The author of book 15 of the *Elements* may then be the same person who inserted the references to Isidorus in Eutocius' commentaries.

Thus, top architects in late antiquity may have enjoyed very high status indeed,[34] they may have had quite advanced knowledge of mathematics and beyond,[35] and may be seen as not only servants of emperor and state, but instruments to glorify God.

Let us move to another architect associated with Justinian. Four inscriptions from Byllis (Albania) and two from the Isthmus of Corinth all concern a Victorinus and deserve full quotation: 'Thanks to the providence of God and the Virgin mother of God, rightly rendering service to the watchfulness and the customs of the most powerful emperor Justinian, Victorinus, a natural general, having erected the citadels of the regions of the Moesians and Scythians and of the Illyrians together with all the land of the Thracians, piously built the wall for Byllis.' 'O stranger, do not overlook the beauty of Byllis, whose walls once fallen down raises the bold Victorinus.' 'Neither do I lament nor do I fear the barbarians, having been

[31] Eutocius, *Commentaries on Archimedes' Sphere and Cylinder* 48.28–31 and 224.7–10, 84.8–11, respectively, *Commentary on Archimedes' Measurement of the Circle* 260.10–12.

[32] [Euclid], *Elements* XV 29.17–30.28.

[33] Heiberg considered all of them interpolations; equally Netz 2004: 269n. 128, 368n. 750.

[34] Cf. also Procopius, *Aed.* 2.8.25, *Wars* 2.13.26, 2.30.5; Prentice 1908: # 305 = *IGLS* 2.348 and # 306.

[35] Texts that inform us on architectural knowledge in late antiquity include Palladius, *Agriculture*; Faventinus, *On Architecture*, tr. in Plommer 1973; Pappus, *Mathematical Collection* book 8.

given the great Victorinus, who works with his own hand.' 'Never to the waters of Lethe the most powerful name of Justinian will be given, but, growing old, time, great and uncountable, will not conceal the efforts of Victorinus, until the height of his virtues has been exalted.' 'Holy Mary, mother of God, protect the church of Justinian the friend of God and Victorinus, who genuinely serves him, together with the inhabitants of Corinth who live according to God.' 'Light from light, true God from true God, protect the emperor Justinian and Victorinus his trustworthy servant, along with the inhabitants of Hellas who live according to God.'

While remarkably similar in lettering and layout, and although they all concern defence works, the inscriptions come from very different contexts: two were found in the environs of Corinth, the others in a relatively small town in Albania.[36] Let us start from the Corinth inscriptions, which are probably earlier.[37] Both have a strong religious tone (a marriage of military defence and Christianity also found in Procopius), expressed in proper catechetical terms (*theotokos*, mother of God, for the Virgin Mary; and the beginning of A29 is straight out of the Nicean creed). Remarkably, there is no reference to works of any kind,[38] and Victorinus is characterized in a very humble manner, as 'genuine slave' or 'servant' of Justinian, in his turn a friend of Christ.

Byllis was a pre-Hellenistic foundation, on a hill, surrounded by a wall whose excavation has revealed four strata, the most recent one corresponding to our inscriptions and perhaps built in response to a barbarian invasion in AD 551.[39] The other main area of architectural activity in the sixth century was Christian buildings: four basilica churches have been excavated at Byllis, at least two of which seem to date to Justinian. Overall, 'they demonstrate the existence of accomplished local workshops in the western part of the province of New Epirus during the fifth and sixth centuries'.[40] Now, the Byllis inscriptions tell us of Victorinus' piety, but above all of his being a 'natural general' – indeed, as is clear from Procopius, a knowledge of military tactics was as important as architectural

[36] Donderer 1996: A24, A25, A26, A27 (from Byllis), A28, A29 (from the Isthmus of Corinth), respectively; see Feissel 1989 for alternative references. They all have crosses at the beginning and/or the end, which may or may not have a Christian meaning. Also, both Corinth inscriptions and at least two of the Byllis ones are on a *tabula ansata* (A28 had the sides cut off), cf. Ritti 1981: 82. Procopius mentions the Corinth works, *Aed.* 4.2.27–8, but not the Byllis works, which could be a matter of chronology: Feissel 2000: 92–3.

[37] Guarducci 1978: 329: the Corinth inscriptions are before AD 539–40.

[38] Donderer also notices this.

[39] Praschniker 1922–4: 68–78; Baçe 1976: 69–70; Myrto 1998: 65; Bowden 2003: 179.

[40] Andrea 1992: 81–2; Korkuti and Petruso 1993: 724, 739 (quotation); Myrto 1998: 64–6.

skills in devising the right design for fortifications. Elsewhere, in sharp contrast with the Corinth characterization of Victorinus as a genuine slave of Christ, we have him as 'bold', and his boldness is linked to his making the city beautiful. Or we have Victorinus as 'the great who worked with his own hand' in order to free the city from fear, as if his direct intervention was a better guarantee of safety. And again, the epigram mentions the mythological Lethe, the passage of 'long and immeasurable time', and the *ponous* (efforts or labours) of Victorinus – an implicit reference to Heracles? And, above all, why are the Christian references in Byllis arguably more muted than in Corinth?

The Victorinus inscriptions present a bewildering variety of points of view – one addresses the reader directly as 'stranger', while in another the city of Byllis herself speaks. Some sound more, some less official; together they provide a multi-faceted take on what it meant to be an architect. Or do they? The trouble is, apart from the expression 'with his own hand' (*autocheiros*), there is no concrete suggestion that Victorinus was a specialized builder.

Let us pause on this point for a moment, and move our attention to the following epigram: 'With his hands having worked not less on our walls than the people who are inhabitants of the city, precisely here <the statue of> the glorious eminent leader Scaurianus, very wise and full of various wiles, the leaders <of the city> have set up, a work of his divine virtue, remembering the shapeliness of all construction.'[41] Scaurianus is surrounded by images of technical achievement: his hands open and dominate the picture, which is closed by the epithet *poikilometes*, typical of Odysseus, and by an exaltation of all *tektosyne*.[42] But one has to wonder, is this just rhetoric, a wile among others – was Scaurianus really an architect, since he is never called so?

Victorinus' and Scaurianus' inscriptions testify to the pride taken in architectural achievement: they are couched in poetic language, and emphasize the importance for the community of the buildings to which they refer, sometimes providing details about things that may have been more difficult to accomplish or more spectacular to behold. Similar inscriptions are set up by people whom we know to be of high status, possibly in government posts, possibly even close to the emperor.[43] But there is, I repeat, an ambiguity

[41] Donderer 1996: A71, Ephesus, second half of the third century AD, cf. Keil 1937: 204–5. We know from another inscription that Scaurianus was *procurator Augusti*: Donderer 1996: A140, cf. Eck 1997: 401n. 4.

[42] *Palame*, 'hand', is often used for divine agents, see Liddell and Scott *s.v.* For the mechanical and technical connotations of Odysseus' knowledge, see Detienne and Vernant 1974.

[43] Donderer 1996: A18, A71 (again putting one's hands to the job is mentioned), C4, C5 = Merkelbach and Nollé 1980: # 2043, this latter an epigram by the then proconsul of Asia; cf. Eck 1997: 401.

about the actual professional circumstances of the dedicators, reinforced by the choice of expressions such as 'with one's own hand' even in circumstances when direct intervention seems unlikely. I will return to this point in the conclusion; for now, let me just observe that, even if these people were not all architects, they seemed more than happy to pass as such.

I will provide just one more example from our available evidence on late ancient architects, which encapsulates many of the features we have seen so far. It is a group of inscriptions, produced between AD 390 and 402, from Brâd in Syria. They are all architectural blocks of a church which took at least three years to complete: one is inscribed with the name of Julianus the *architekton*, one with Julianus *technites* and his brother Marinus, one with Julianus the *oikodomos* and again his brother Marinus.[44] Given our nomenclature uncertainties, it is intriguing that Julianus calls himself three different things in three different inscriptions. Perhaps his role changed over the years, as he acquired greater responsibility on the building site – which would confirm that the top of the profession was denoted by *architekton*, the capacity in which Julianus completed the church. But Julianus and Marinus are not alone: an architrave from the same church refers to a Daniel, *oikodomos*, who made (the piece? the vault?), with Dorotheus and Pelagius, *ex voto*.[45] What was the relationship between Daniel and Julianus? There are more inscriptions on architraves or central arch stones – legible enough, if above eye level, and meant, I think, to be seen by the local congregation.[46] Many of these are in the form 'so-and-so made this'; some are more complex: 'Flavius Daniel son of Himerius, shield-maker *ex voto* to God together with his brothers made the vault.'[47] Is the Daniel here the same as in the other inscription? Or was it simply a common name in Brâd? Again, the boundary between making the church as builders and making it as commissioners and donors is definitely blurred. It is conceivable that if indeed a relatively small place like Brâd had a fair concentration of building experts,[48] they would have played a large role in the building. On the other hand, it looks as if the church was paid for by the subscription of various

[44] Donderer 1996: A 46, A 47 = Lassus 1947: 257 # 1, 258 # 9, respectively, plus Donderer 1996: A 48 and A 49. Brâd was small, but not exclusively agricultural; there is evidence of processing of agricultural products, and of some wealth. The basilica contains recycled material from a pagan temple, and is one of the largest churches in Syria from that period.

[45] Lassus 1947: 257 # 12. [46] *Contra* Lassus 1947: 257 and plate 48.

[47] Lassus 1947: # 7. Also, Theoktistos made the centrepiece of an arch in A 47 (Lassus 1947: # 9); Zabdas made a centrepiece of an arch *ex voto* (Lassus # 2); *ditto* Eusebius son of Domnos (Lassus # 3) and Artemidorus (Lassus # 5); the centrepiece of an arch with the name of Flavianus (Lassus # 4); another arch centrepiece for the safety of Kyros son of Marcianus and Kalliopos (Lassus # 6).

[48] Lassus 1947: 261; Strube 1993.

citizens, and this may have given them more say in the design, compared with the situation where a bishop or an emperor were the main commissioner. This would explain why the various people whose names are recorded on pieces of the church felt entitled to proclaim that they had made it. The multiple dedications certainly point in that direction. Their position, on architraves or arch centrepieces, suggests, on the one hand, an emphasis on the pivotal role of those pieces in the structure of the building; on the other hand, a strong identification with the material edifice itself, a church whose bricks almost literally consist of the faithful in the community.[49]

In conclusion, and to revert to our initial question, who were the late ancient architects? The epigraphic material so far has revealed a very diverse picture. It is clear that different levels of expertise and authority existed, yet the terms used to denote those levels appear relatively fluid. At least some of the architects whom we know to have been active in our period were highly literate, were conversant with the most important and complex works of the ancient Greek mathematical tradition, and may have been capable of producing some advanced mathematical work of their own. They were also close to the upper social and political groups, and sometimes fully part of them.

A substantial group of specialized builders were part of the military, and consequently travelled with the army,[50] but we also find that several late ancient professionals in these categories conducted a rather localized life. Well integrated into the urban fabric, even of small cities, their individual voices convey a general impression of pride in the profession, and desire to be identified with it and with its products, while at the same time claiming its significance for local communities. Take this epigram:

I am the tomb of Harpalos. Which Harpalos? Why, Harpalos most skilful in the Daedalian craft. This I know, O Fates: his all-inventive art has perished with him.

[49] Other Christian buildings where the locals' involvement was key: Donderer 1996: A56, from Batuta in Syria, AD 363 or 563, cf. Butler 1920: 332, Jalabert and Mouterde 1929: # 391; Donderer 1996: A72, from the door of a *martyrium* for St Sergius in Zebed (Syria) AD 512; Donderer 1996: A1 = Keil and Wilhelm 1931: # 99, late ancient, from Diocaesarea/Uzundja Burdj; Donderer 1996: A19, from Georgia, see Robert and Robert 1958: 345 for the date.

[50] Donderer 1996: A74, A75, A76, A77, A78 (see Pflaum 1952 for alternative references), A88 = *CIL* 13.6680, A96 = *CIL* 3.7688, A101 = *CIL* 10.1757, A145 (from Germany), A146 (from Scotland) = *CIL* 13.7945 and *CIL* 7.1062, respectively (Dessau, *ILS* 2459, has an alternative reading of A145). Hyginus, *On Military Camps* (mid-second century AD? later?) provides a glimpse of what a military architect was expected to do or know. See also Whicher 1906: 293; Littmann, Magie, Reed Stuart 1921: 283–5 and # 636; Miller 1937: 208–9; Alföldy 1968: 17–27; De La Bédoyère 1989: 145; Evans 1994: 148.

What other man alive was his peer? He who laid out beetling temple walls, who raised columns for high-ceilinged porticoes – he would often move the very mountaintops, servants to his puny ropes, as easily as boys gather twigs. So Amphion, so Orpheus once charmed the rocks with song and led them effortlessly away.[51]

To have the name of the deceased right at the beginning is a strong-impact device found in other funerary epigrams; several of the terms used in the epitaph (e.g. 'Daedalian') are typical Homeric expressions, and the allusions to the mythical poets and musicians Orpheus and Amphion are found both in other funerary epigrams, and in funerary art. At the same time, there is a strong technical dimension: the emphasis on effortlessness and wonder is common in descriptions of technical achievements. Also, unlike similar epitaphs, the tomb talks first, instead of answering the query of the passer-by, as if monuments themselves were legitimate interlocutors in the case of an architect whose life was mostly dedicated to producing them.

Harpalos appears to have been well respected and well-to-do, but some humbler testimonies have also survived. On the lintel of a doorway outside the gates of Kokanaya, a small town in Syria, we find: 'There is one God and Christ. [AD 378] Damas *technites*.'[52] Or, again from Kokanaya, on the lintel of a private house: 'The power of God and of Christ erected [this] [AD 431]. Domnos *technites*.'[53] If we only look at the material from Syria, there is a surprisingly high number of short inscriptions, often on architectural elements, often in small towns, generally using the terms *technites* or *oikodomos* for the builder. The majority of them is recognizably Christian; indeed, many of the inscriptions are on pieces of, or refer to, churches and other religious buildings.[54]

Across the spectrum, Anthemius and Victorinus and Damas and Domnos share, more than architectural knowledge or the ability to produce an imposing vault, as opposed to a simple roof, a strong sense of pride in their achievements, and awareness of their importance for the community, whether they were fortifying the city against barbarian attack, building

[51] Donderer 1996: A8; Engl. tr. in Taylor 2003: 1, slightly modified; see also Bernand 1969: # 23, with picture – I am indebted to his commentary. The present location of the tablet, originally from Hermopolis Magna in Egypt, probably from the early third century AD, is unknown. See also Donderer 1996: A12, A13, A14, A15, A16 (= Latyschev 1885: II 430, 434, 433, 429, 451), A20, A32, A34 = *CIG* 3.4286; Burkert 1992; Nollé 1995.

[52] Prentice 1908: no. 35. [53] Prentice 1908: no. 37.

[54] See Waddington 1870: nos. 1984, 1984d, 1999, 2021b, 2022, 2037, 2053b, 2070p, 2091, 2150, 2168, 2235, 2299, 2421, 2465; Prentice 1908: nos. 3, 73, 76, 278, 279, 283, 386; Littmann, Magie, Reed Stuart 1921: nos. 159, 177, 197, 685, 738, 783^{1}, 786^{1}, 787^{8}, 787^{10}, 800^{7}; Prentice 1922: nos. 1076, 1080, 1089, 1094, 1095, 1096, 1120, 1141, 1142, 1143, 1146, 1159, 1161, 1170, 1176, 1177 (these two latter from Brâd), 1190, 1212, 1213. Given the year of publication of these epigraphic collections, the list is certainly incomplete.

a private house or, increasingly often, providing God and his people with a place of worship.

DID THE STATUS OF ARCHITECTS CHANGE IN LATE ANTIQUITY?

First, a slightly different question: did architecture change in late antiquity? Apparently yes. The main features of the change can be summarized thus:[55] first, a new approach to the old. While imperial legislation encouraged the preservation of the extant infrastructure over new public works, late ancient attitudes to the vestiges of tradition led to the recycling both of materials and of entire buildings from the past. A prime example of the first practice is the Arch of Constantine in Rome; of the second is the adaptation of pagan temples or basilicas into churches, albeit that was not as common as has been thought.[56] New work consisted primarily of fortifications and churches,[57] as well as water supply structures. The whole idea of 'new', however, does not correspond to ours: re-use, refurbishment or restoration of what was already there – adding an extra layer to the previous ones – counted as 'new', and could thus ground claims that, for instance, Justinian had founded or made something from scratch.

Secondly, the building traditions of the Eastern and Western parts of the empire apparently became increasingly distinct, with internal differentiation producing regional styles.[58] Some historians identify the basilica shape, common under Constantine and his direct successors, as a more typically Western style (although many basilicas are found in the East), while the centralized building plan favoured by Justinian, albeit of Roman origin, would correspond to the Eastern style.[59] The basilica-shaped church was directly inspired by the eponymous Roman meeting space, loosely connected to some idea of the state as *res publica*, while centralized churches, perhaps inspired by the audience halls of royal palaces, presupposed a more hierarchical structure. The underlying metaphor was that the house of the heavenly King was an expanded and more splendid version of the emperor's palace.[60] Thus, although the basilica type remained

[55] My account is heavily indebted to Wright 2000: 131–2.
[56] Buchwald 1999; Judith McKenzie (personal communication).
[57] For symbolic intersections between the two, see Procopius, *Aed.* 1.1.27, 1.3.9.
[58] See e.g. Krautheimer 1965: 71–3; Ward-Perkins 1984.
[59] Krautheimer 1965: 151–2; Wright 2000: 134–5: in the West the centralized design was not 'readily acceptable'.
[60] See e.g. Mango 1976: 89, 98; Mainstone 1988: 149; *contra* Mathews 1999: 15.

prevalent everywhere, somehow the centralized church, a type found since the time of Constantine, has become emblematic of the period.[61]

The centralized church shape used some distinctive building techniques – the third marked change from high empire to late antiquity identified by historians of architecture. There was apparently a decline in the use of dressed stone, and an increase in the use of brick,[62] but that needs to be qualified at the local level, because there are several exceptions, depending, for instance, on the economic resources available. Most noticeably, the techniques for constructing vaults and domes developed and diversified. Although they were by no means a new thing, as the Pantheon in Rome (made out of concrete) testifies, more vaults and domes seem to have been built in late antiquity, in different ways, with different significance and visibility.[63] A simple look at vaults in Byzantine architecture[64] reveals a variety of techniques, some more, some less complex, corresponding to different financial and institutional investment, but also different competences on the part of the builders involved, and perhaps different inputs from mechanical or geometrical notions. The Eastern architects used reasonably uniform 'small sized mortared rubble work' in combination with load-bearing baked brick. Vaults made with mortared bricks could sometimes be built without centering, i.e. support scaffolding, which itself was complicated to build and take off at the end.[65]

One of the most famous examples of late ancient dome construction is obviously that of Hagia Sophia. As we have mentioned, this massive church was built to replace one that had been burnt down in a riot in AD 532. Now, it is interesting that the former church did not have a vault, but a timber roof, and was basilica shaped. The new edifice, instead, while retaining the basic basilica scheme, added a whole system of vaulted spaces and a big central dome, which was to span an exceptionally large floor space.[66] Procopius and others attest that the dome was the most eye-catching feature of Hagia Sophia, not only in its finished state, but also during construction. The dome was probably also the main structural problem which the architects (or Justinian – or God) had to solve. Essentially, there were two options: a low and flat 'saucer' dome or a steeper independent dome, built on the circle provided by the pendentives (i.e. spherical

[61] Buchwald 1998: 1 42.
[62] This may be due to the increased use of the military as workforce for public buildings: Wright 2000: 132–3.
[63] Mainstone 1973 [1999]: 7. [64] Mango 1976; Lancaster 2005.
[65] Wright 2000: 135–6; Taylor 2003; Lancaster 2005.
[66] Buchwald 1998: 1 39–41; Wright 2000: 137.

triangles formed when two arches are set at an angle to each other). The 'saucer' solution was first chosen, but after its collapse a few years later, the builders seem to have opted for an independent dome.[67] Apart from the technical complexities, the choice of new shape for the church sounds significant. From a participatory spatial arrangement to a highly complex, awe-inducing, hierarchically organized one: the new church sounds so much like a manifesto for Justinian's power that one really wonders, with Procopius, whether the destruction of the former building was not almost to be desired, so that the new one could be erected.[68]

What about the architects themselves – how did *they* change? For instance, how does the epigraphic evidence we have surveyed in the previous section compare with similar evidence from the first and second centuries AD? Generally speaking, there are fewer inscriptions overall from late antiquity, especially from the fourth century AD onwards, and there are more late ancient inscriptions from the Near East than from the West.[69] We are not therefore in the position to compare like with like if we compare across centuries. Nonetheless, we can say that a cursory survey based on just the material collected by Donderer reveals some trends. In terms of social status, there are relatively many more freedmen among the architects of the first and second centuries AD than at later periods. The freedmen in the late ancient group tend to come from the Western part of the empire. Again, a relatively greater number of inscriptions from late antiquity have an official character, meaning that the inscription is either set up as part of a state enterprise, say a state-sponsored building, or the emperor is invoked in some official or semi-official capacity, or the architect in question is presented as having had a public role, be it in the military or the administration. And finally, the great majority of architect-related inscriptions in verse come from late antiquity. I take the presence of an epigram to signify more spending capacity, literary skill or access to someone with literary skill, and a certain taste or education.

Consequently, my first impression is that, if anything, architects saw their status, visibility or prestige increase in the late ancient period. That impression can be sustained if we look at some evidence of explicit public support for architects. Already Severus Alexander (emperor from AD 222 to 235) had allegedly instituted regular salaries for rhetoricians, grammarians, doctors, *haruspices*, mathematicians (or astrologers), mechanicians and architects. He assigned them lecture rooms and ordered rations to be given to their pupils if

[67] Mainstone 1988: 163–8; Wright 2000: 140.
[68] Procopius, *Aed.* 1.1.22. [69] Feissel 2000: 84–5; cf. also Liebeschuetz 1977.

they were freeborn but poor.[70] Under Constantine, we find a slew of laws, the first in AD 334, and addressed to Felix, prefect of North Africa:

> One needs as many architects as possible, but, because there are not, let your highness exhort to this study those in the African provinces who are about twenty-two years old and have a smattering of literary education. So as to give them an incentive, it is our wish that both them and their parents be exempt from personal fiscal obligations, and a proper salary be assigned to those who teach.[71]

The idea that architects should have a good educational background matches what we have seen of the 'top' of the profession so far; the emphasis on teaching reveals the state's preoccupation with forming the next generation, and reinforces the initial, remarkably strong message of the decree: architects are necessary.

Similar laws were issued in subsequent years, extending beyond architects to other technical professions. Constantine wrote to Maximus, praetorian prefect this time of Gallia: 'We order that the technicians practising the *artes* included in the appended list who remain in each community, be exempted from all obligations, if some of their spare time be employed to teach those *artes*, so that they have an incentive to do it, and they both become better experts themselves and instruct their children.' The list includes: 'architects, doctors, veterinarians, painters, statue-makers, marble-workers, [. . .] builders, ('*structores* (*id est aedificatores*)'), wood-sculptors, [. . .] trousers-makers, water-engineers, [. . .] wagon-makers, sculptors, plasterers, money-coiners, linen-weavers, carpenters (*tignarii*) [. . .]'.[72] Apart from the clear labelling of both architects and doctors as *artifices*, it is interesting that, while status distinctions did exist between a doctor and a fuller, from a legal point of view they are still seen as part of the same category. The tone of Constantine's latest surviving law on the matter is probably the strongest:

> With these words we compel mechanicians, geometers and architects, who preserve the divisions and partitions of all pieces <of land>, and who pull together a piece of work by designing structures, and those who discover the course of water and demonstrate its size through skilful levelling, to devote themselves equally to teaching and learning. Let them enjoy their fiscal exemptions and train teachers, so that there are enough of them.[73]

[70] *Historia Augusta. Severus Alexander* 44.4. [71] *CTh.* 13.4.1.

[72] *CJ* 10.66.1 (AD 337). The same at *CTh.* 13.4.2, but the list is slightly different.

[73] *CJ* 10.66.2 (AD 344), Constantine to Leontius, praetorian prefect of, possibly, the East. Slight differences in *CTh.* 13.4.3, where the emperors are Constantius and Constans. Cf. also *Digesta* 50.6.7. On teaching of architecture in late antiquity see Palladius, *Agriculture* 3.11; Cassiodorus, *Variae* 7 5, 15.

Evidently, not even the previous fiscal exemptions had provided enough incentives for some categories of technicians to start reproducing themselves, as it were.[74] In the course of ten years, the laws moved from one category (architects) to many, back to a few selected technical professions whose role was carefully specified and that must have been viewed as crucial.

Compared with the early empire, we find an urgency, a concrete concern about stability in the profession, that justify the provision of incentives to make joining the ranks of the privileged technicians highly desirable. At the same time, the demand for architects, and for new generations of them, confirms and intensifies the impression that the government took a strong interest in providing infrastructures for local communities, and in monitoring and controlling changes to the urban landscape.[75]

And we are back to Justinian, or rather to Procopius. How accurate a portrait of the emperor vis-à-vis the architects does he provide? Procopius' works have been the subject of much debate. In his *Secret History* Justinian is, quite literally, the devil incarnate. Consequently, a very big cloud hangs over the sincerity of works like *Buildings*, which depict the emperor in a positive light. Some historians have interpreted the text as marking a change of heart, or as an attempt to curry favour; others have pointed out fault lines of dissonance under the apparently smooth surface of praise.[76] There may be elements of both. In other words, the representation of Justinian in *Buildings* may be affected both by concerns about how the emperor wanted to be viewed (a panegyric, acting as a kind of mirror for the ruler),[77] and by a reflection on his rule which may not have been entirely positive. One way or the other, and more significantly for this chapter, the medium chosen by Procopius to convey strong images of power, piety, and political virtues is architecture.

On the one hand, Justinian is introduced by Procopius in almost Christological tones,[78] as bringing order and harmony out of chaos and strife:

[74] De Francisci 1954–5: 64–9.

[75] Other laws regulating building in this period include *CJ* 8.10.2 (AD 222); *CJ* 8.10.6 (AD 321); *CJ* 8.10.7 (AD 363); *CJ* 8.11.7 (AD 384); *CJ* 8.11.13 (AD 398); *CJ* 8.11.22 (AD 448); *CJ* 8.12.1 (AD 485–6); *CJ* 8.10.12 and 13 (AD 531).

[76] See Gantar 1962a, 1962b, 1963; Rubin 1957: 575; Rousseau 1998; Kaldellis 2004: 53; the German edition of *De aedificiis*, 12. *Contra* Evans 1974, and, to a lesser extent, Michael Whitby 2000.

[77] Gibbon (quoted in Evans 1972: 15) may have been the first to label *De aedificiis* a panegyric. This idea has been followed by the great majority of scholars; see e.g. the introduction to the German edition of *De aedificiis*, 8, 10; Downey 1939 and 1947; Rubin 1957; Croke and Crow 1983: 143; Cameron 1985: 9–11, 233.

[78] On this theme see Cameron 1985: 88; Rousseau 1998: 126; Mary Whitby 2000: 47; Michael Whitby 2000: 64; Kaldellis 2004: 139: relevant passages include *Aed.* 1.1.21; 1.10.19. Justinian is compared to God also in Paulus Silentiarius, *Ekphrasis* 153–4. Incidentally, the title of the work Περὶ κτισμάτων might

in this time was born to us the Emperor Justinian, who, taking over the State when it moved out of tune,[79] has not only made it greater in extent, but also much more illustrious, by expelling from it those barbarians who had from old pressed hard upon it [. . .] [Justinian] has created countless cities which did not exist before. And finding that the belief in God was, before his time, straying into errors and being forced to go in many directions, he completely destroyed all the paths leading to such errors, and brought it about that it stood on the firm foundation of a single faith. Moreover, finding the laws obscure because they had become far more numerous than they should be, and in obvious confusion because they disagreed with each other, he preserved them by cleansing them of the mass of their verbal trickery, and by controlling their discrepancies with the greatest firmness[80] [. . .]. Furthermore, he strengthened the Roman domain, which everywhere lay exposed to the barbarians, by a multitude of soldiers, and by constructing strongholds he built a wall along all its remote frontiers. However, most of the Emperor's other achievements have been described by me in my other writings, so that the subject of the present work will be the benefits which he wrought as a builder.[81]

The architectural undertones of even the non-architectural enterprises are evident;[82] what is more, Justinian is presented as a super-technician: a demiurgic figure. There are echoes of Plato's *Timaeus*[83] in the reference to a state moving out of tune,[84] when Justinian is said to have 'roundly shaped' the church;[85] when his building activity is called *demiourgein*,[86] and when Procopius refers to the model of the new church, which is present to the mind of Justinian before the people of Byzantium could see it.[87] Just like the semi-divine demiurge, Justinian is made to represent sometimes

mean both 'buildings' in a very general sense, and creation in the religious sense of the word; see Liddell and Scott *s.v.* κτίσις; Downey 1938, 1946 27; Geanakoplos 1966: 185. Unfortunately, the title can be traced back only to AD 900, see the introduction to the German edition of *De aedificiis*, 9.

79 The language of harmony used to talk about the buildings: Procopius, *Aed.* 1.1.29, 1.1.47. Cf. Choricius of Gaza, *Laudatio Marciani* 1.18, 25–6. On this and on the possibility of 'Platonic architecture' at this time see Buchwald 1992: XI 316–21.

80 The complete reversal of this in Procopius, *Secret History* 11.1.

81 Procopius, *Aed.* 1.1.6–12. The opening sentence echoes biblical passages such as Isaiah 7.14, 9.6, in their turn echoed in the Gospels' narration of the nativity of Jesus. Rubin 1957: 342, sees an allusion to the Gospel of John in *Aed.* 5.7.3, but cf. Cameron 1985: 92n. 66: scriptural citations are extremely unusual in Procopius. Cf. also Paulus Silentiarius, *Ekphrasis* 7–9.

82 The emperor is attributed *techne* at *Aed.* 1.11.17, 4.9.9, cf. 1.1.52, 2.9.11; Choricius of Gaza, *Laudatio Marciani* 2.39; Paulus Silentiarius, *Ekphrasis* 199, 456, 512, 517, 527; Mary Whitby 2000: 49–50.

83 Kaldellis 2004: esp. ch. 3.

84 The phrase is πλημμελῶς κινουμένην, in Plato, *Timaeus* 30a.

85 The word is ἀποτετόρνευται, *Aed.* 1.1.22, 1.1.28, 1.1.61, 1.3.17, 1.9.15, 1.11.18, cf. Plato, *Tim.* 33b: the Demiurge shapes, ἐτορνεύσατο, the universe.

86 Procopius, *Aed.* 1.1.31, 1.10.1, 4.1.26. As far as I know, this was not common usage: Malalas, for example, in a very similar context, does not use it, cf. Downey 1938.

87 'Model' is ἐκτύπωμα, *Aed.*1.1.22, 2.3.8, cf. τυπωθέντα, explaining how things in our world are patterned after the Forms, at Plato, *Tim.* 50c.

superhuman, sometimes human *techne*.[88] His ideas, invariably linked to technological feats, often seem wild and impossible.[89] Indeed, at times Procopius shows how God's momentum (*rhope*) surpasses human *techne*,[90] and not just in architecture: he depicts human doctors at a loss and having to yield to the healing powers of various Christian saints.[91] This makes Michael Whitby's otherwise acute statements slightly problematic:

> in the *Buildings* one can construct a hierarchy of achievement in which Justinian has the ability to resolve the ἀμηχανία or ἀπορία of ordinary human beings: *he* can deploy the necessary devices, skills and means [. . .]. On a very few occasions even Justinian is ἀμήχανος, but then God steps in to reward his piety, the key virtue which lifts Justinian above the rest of humanity. *There is nothing complex or ambiguous about these relationships*, or the closeness of emperor to God.[92]

It has been suggested that Procopius himself was an architect or engineer, because his interest in technological products, evident in *Buildings*, is also displayed in the numerous and accurate descriptions of siege techniques or weapons in the *Wars*.[93] In this respect, I think his use of the term *mechane* and cognates in *Buildings* is worth highlighting. Apart from Apollodorus, as we have seen at the beginning of this chapter, the architects mentioned in the book are called mechanicians (*mechanopoioi*).[94] *Mechane* is often used to denote devices or things that allow one to do or work out something,[95] while its opposite *amechane* indicates difficulties in the material world.[96] On the other hand, Procopius also uses *amechane* to indicate the impossibility for the writer, especially himself as a writer, to describe something in words.[97] In this peculiar form of *recusatio*, Procopius can perhaps be seen as a technician of a different kind: architects have erected

[88] Procopius, *Aed.* 2.7.9, 4.2.11, 5.1.13, 5.5.3, 6.6.13.

[89] Procopius, *Aed.* 5.3.11, 5.5.3, 5.6.10, 6.5.6. In Procopius, *Secret History* 26, see also 8.7, 11.3, 19.6, we have a very different portrait of Justinian vis-à-vis technicians of various kinds.

[90] Procopius, *Aed.* 1.1.61. Cf. also the anonymous *On the Inauguration of St Sophia* strophe 5 (probably AD 562), translated in Palmer and Rodley 1988: 141.

[91] Procopius, *Aed.* 1.6.5–8, 1.7.13. Cf. Choricius of Gaza, *Laudatio Marciani* 1.60; Paulus Silentiarius, *Ekphrasis* 222–5.

[92] Michael Whitby 2000: 63, italics mine.

[93] Howard-Johnston 2000; e.g. Procopius, *Wars* 1.1.16, 5.21.1–12, 8.11.27–8. See also Priscus, *Historia* fragment 6.2 (Blockley).

[94] Procopius, *Aed.* 1.1.50: Anthemius and Isidorus, 2.3.2: Chryses, 2.8.25: Isidorus of Miletus, nephew of the other Isidorus, and Johannes of Byzantium. Also, μηχανικοὺς at 2.3.11 (Anthemius and Isidorus) and τὰ μηχανικὰ εὐδοκιμοῦντας at 2.3.7 (Anthemius and Isidorus).

[95] Procopius, *Aed.* 1.1.50, 2.3.4–11, 3.5.9. Sometimes *techne* is used to indicate the same thing, e.g. 2.7.7.

[96] Procopius, *Aed.* 2.2.9, 2.3.24, 4.1.38, 4.5.3, 5.3.11, 6.6.13. The term has a very wide spectrum: it also denotes the accessibility of a place.

[97] Procopius, *Aed.* 1.1.3, 1.1.49, 1.1.50, 1.1.64, 1.2.18, 1.10.10, 1.11.9, 2.1.2, 2.8.15, 2.10.24, *passim*. This was already noticed by Michael Whitby 2000. See also the remarks in Taylor 2003: 5. Paulus Silentiarius,

the church, with the help of their own expertise, imperial support, and divine guidance, but a possibly even more durable church is being constructed by the writer's description of it. The writer is a builder of sorts in that he has to design an organized structure, choosing the right order of proceeding and the appropriate decoration. In this sense, Procopius' real affinity is indeed with Anthemius and Isidorus – a different kind of architect, but with a similarly problematic relationship with the emperor.

Together, the legal evidence and Procopius indicate that the government's attitude to architects in late antiquity was one of great interest, wish for control and, at least in some cases, of wanting to take over the architectural mantle not just as far as identification with the completed building, but as far as identification with the design and construction of the building, were concerned. In other words, what we see with Justinian is not simply erasure of the architect from the picture, but the taking over of the architect's specific brand of knowledge. It is this latter feature – the crux of the contrast between Hadrian and Apollodorus we reported at the beginning – that I would see as more typical of this period than of earlier ones, also because it is reflected in some of our epigraphic evidence. The high public profile of architecture and its relevance for the government thus matches the impression of increased visibility and close ties to the community that we received from our survey of the inscriptions.

THE SPIRITUALIZATION OF ARCHITECTURE[98]

The question we asked at the beginning of last section – did the status of architects change in late antiquity? – cannot be satisfactorily answered without dealing with one of the biggest changes of late antiquity: the rise of Christianity. The careful reader will already have picked up some signals along the way, but let me tackle the issue by taking you back to the mosaic with the building-site scene (fig. 5.1, see page 136). One detail that I deliberately omitted is its original context: it was the floor of a church. Now, what is a mosaic with a significantly arranged building scene doing on the floor of a small church in Tunisia? As a celebration of the building process itself, it is yet another example of the self-referentiality of ancient technology which we have encountered in chapter 3. Besides, the mosaic, of course, celebrates the architect or, for that matter, everybody involved in the

Ekphrasis 282 conveys the difficulty of describing the masterpiece (but does not use *amechane*). Choricius of Gaza, *Laudatio Marciani* 1.22–4 in similar situations tends to use *aporia* and related words.

[98] The phrase is Irving Lavin's, whom I wish to thank for his generous help with this chapter.

Figure 5.2 Funerary mosaic from Tabarka (ancient Thabraca): Musée du Bardo, Tunis, inv. A 307.

building process. But also, and crucially, it must have been seen as a motif appropriate for Christian art, in a strongly religious and ritual context: erecting God's house from its foundations was seen as an act of piety, and the performance of a kind of liturgy.

Take another Tunisian mosaic from Tabarka (ancient Thabraca), dating to the fourth- or fifth-century AD. The inscription reads 'Mother church, Valentia <rests here> in peace'.[99]

This piece has been studied primarily for the evidence it provides about architectural design, particularly that of late ancient North African churches; historians have remarked upon its mixture of plans of visions, since it shows a church both from the front and sideways, but without walls, and almost from the top, because we are shown the mosaic on the floor. What I find more interesting, however, is the function it had as a piece of funerary art. Keeping in mind the examples we saw in chapter 3, it is intriguing that Valentia, or her family, should have chosen an architectural image to mark her peaceful rest. The *ecclesia mater* is both the building and the religious institution; the tomb, insofar as it is a building with the image of a building on it, can itself function as repository and shelter, fulfilling a motherly role for the body of Valentia. The choice of the church image underlines the fact that the Church was also the church, and both were mothers: a spiritual body which would take the faithful into her bosom and lead them to salvation and rest, and a material embodiment that would shelter their dead bodies and protect them from outside interferences.

[99] Fantar et al. 1994: 154.

The house- or temple-shaped sarcophagus in fig. 3.3 could just as easily fall into the same category as the mosaic here. The tools engraved on it are a reference to the building process, too, and the building itself could be a church, especially given the presence of the object in a Christian context, i.e. a catacomb.

Or take a late ancient underground chamber tomb found in Rome, and identified with the burial of a Trebius Iustus.[100] The frescoes in the tomb juxtapose agricultural scenes, scenes of offerings with Iustus' family bearing gifts in a Christian context, and two architectural scenes: one of a building site, vaguely reminiscent of the camp-building images on Trajan's column, and the other the picture of a man talking to an architect, in pretty much the same pose as the architect in the top level of the Oued Rmel mosaic. The presence of a building scene need not refer directly to Trebius Iustus' profession, or to that of his father. Rather, as we saw in chapter 3, it could be on the same symbolic register as the agricultural scene and the offering scene: a rendering of grace to God, in order probably to ingratiate him on the occasion of the young man's death, through images of direct and indirect gift-giving – showing not the gifts themselves but the production of the gift. The agricultural scene is a reference to the harvest, and to the literal or metaphorical first fruit one is supposed to offer God, and the architectural scene is a reference to building and construction, and to the literal or metaphorical testimonial (remember how Hagia Sophia is a testimonial for Justinian's piety) one is supposed to render to God in a public context.[101]

The importance of producing new cultic buildings in the establishment of a new religion cannot be overemphasized. When the Christians were persecuted in the third century, a lot of emphasis was put on forbidding them to meet in certain places, such as cemeteries. Later on, the destruction or recycling of pagan temples marked the decline of the old religion.[102] On the other hand, a more tolerant attitude to Christianity was signalled, for instance, by a decree allowing them back into their places of worship. The importance of having a specific space in which to congregate and practise one's rites was not uncontroversial. Several voices rose within early Christianity reminding believers that the real temple of God was one's heart, and that God does not want ornate walls and marble altars and statues.[103] Origen (N.B. not part of the eventual orthodoxy) wrote that the

[100] Petrassi 1976.
[101] Indeed, Justinian is said to build churches to prove or demonstrate his faith: Procopius, *Aed.* 1.4.1.
[102] Martin 1984: 211–12.
[103] E.g. Acts of the Apostles 7.48–9; 17.24; Jerome, *Epistulae* 52.10, 58.7.

statues and offerings that please God are not those of *banausoi technitai* but those of the divine *logos* that shapes them in us.[104]

More usually, though, and increasingly so as we move from the third to the sixth century, the official representatives of the church not only sanctioned, but took a leading role in building concrete, mundane testimonials to their faith.[105] At least one bishop appears to have become something of an expert: Gregory of Nyssa in a letter described the plan of a martyr's shrine in some geometrical detail. The building was in the shape of a cross, and the middle of the cross was a circle divided into eight angles, i.e. an inscribed octagon, of which Gregory said: 'the octagonal shape is called circle because of the curvedness'.[106] He followed with a description of how the parts of the buildings corresponded to the sides of this octagon, and with further details on the geometrical structure of the building, including dimensions and some specific instructions: 'the space between the ovals will measure overall eight cubits; the depth will be given by the curve drawn by compasses with the centre fixed in the middle of the side and extending to its extremities; the height will be in proportion with the depth and made on the basis of it'.[107] Gregory was being specific so that his correspondent Amphilochus could work out the area and size of the shrine, and employ the right number of builders. In other words, Amphilochus was expected to perform a man-hour calculation based on the size of the prospective building. Also, Gregory required the workforce to know how to build a vault or ceiling without wood, because the material was scarce, so a certain type of expertise was required. In fact, in an early example of the sharp business sense often displayed by high members of the Christian Church, Gregory made enquiries about wages, and discovered that the workers in Amphilochus' region were cheaper and better.[108]

With their geometrical substructure, churches functioned as an image of the ordered universe created by God. In particular, the dome of centralized churches functioned as an image of the vault of heaven, both the physical place dotted by stars, and the spiritual reality populated by saints and angels.

[104] Origen, *Contra Celsum* 17–20. [105] Martin 1984; Brown 1992: 120–1.

[106] Gregory of Nyssa, *Epistulae* 25.3. The letter, datable from AD 373 to c. AD 381, is to the bishop Amphilochus of Iconium.

[107] Gregory of Nyssa, *Epistulae* 25.8.

[108] Gregory of Nyssa, *Epistulae* 25.10–15. 'Without wood' might mean 'without centering' – this opens up the question of whether domes were built without centering before Brunelleschi, cf. Mainstone 1988: 172, with further bibliography.

Indeed, vault decorations often include both motifs.[109] One document that encapsulates most of these themes is Eusebius' panegyric 'on the building of the churches',[110] addressed to Paulinus, bishop of the Tyrians. Eusebius goes back to the Old Testament. When talking about the temple of Jerusalem, he mentions not only the kings Solomon and Zerubabbel, but also the architect Bezalel, 'whom God Himself filled with the spirit of wisdom and understanding and with the knowledge as well of crafts and sciences, and called him to be the workman that should construct the temple of heavenly types in symbolic fashion'.[111] The church is presented as a visual demonstration of God's power, something for the eyes to believe: again a testimonial of faith.[112] In fact, two of the persons in the Trinity are described as having technical knowledge: God the Son is a teacher, but also a physician,[113] while God the Father is presented as the doer and the maker; the *demiourgos* of the entire universe, someone who has never ceased to build.[114] The cleansing of the soul through the word of God is described as a demolition and reconstruction job.[115] Aided by the scriptures, Eusebius runs parallels between the architectural and the spiritual: Jesus is the corner-stone of the church, the faithful are the living stones of the new house of God, whereas people of old were architects of bad things; the enemies of the soul are represented as using engines and machines (*mechanai*),[116] and the early churches destroyed by unfriendly emperors were only dead stones.[117] The sustained comparison between the church as a building and the metaphorical church of the faithful is capped by the consideration that God builds both.[118] Eusebius even appears to introduce the bishop as a kind of

[109] See e.g. the Syriac inauguration anthem for St Sophia in Edessa, built between AD 543 and 554, in McVey 1983 and Palmer and Rodley 1988; Paulus Silentiarius, *Ekphrasis* 490–5, 530; Romanos Melodos *Hymn* 54. But cf. Mathews 1971: 3: 'Byzantine commentators [. . .] seem to have attached no special cosmic meaning to the introduction of domes in church design.'

[110] Eusebius, *Church History* 10.4.2–71. Constantine's building piety is a common theme: e.g. Eusebius, *Praise of Constantine* 9.

[111] Eusebius, *Church History* 10.4.3, 25 (Loeb translation). The Syriac inauguration anthem for St Sophia in Edessa mentions Bezalel, the man who 'constructed the Tabernacle for us with the model he learned from Moses, and Amidonius and Asaph and Addai built a glorious temple for you [God] in Urha [Edessa]'. I quote from McVey's 1983 translation, second strophe. Amidonius has been identified with the bishop Amazonios of Edessa (McVey 1983: 98; Palmer and Rodley 1988: 126–7); Asaph and Adai could be the architects (McVey 1983: 98) or other bishops (Palmer and Rodley 1988: 127–8).

[112] Eusebius, *cit.* 10.4.6.

[113] Eusebius, *cit.*10.4.11 – with a quotation from Hippocrates, *On Natures* 1; Romanos Melodos, *Hymn* 54; Mathews 1999: 66–72; Meißner 1999: 52–6.

[114] Eusebius, *cit.* 10.4.8, 10.4.9, 61. God as *demiurgos* is a common theme in Christian literature, see Theiler 1957.

[115] Eusebius, *cit.* 10.4.60. [116] Eusebius, *cit.* 10.4.57.

[117] Eusebius, *cit.* 10.4.14,. 21, 65. [118] Eusebius, *cit.* 10.4.63–8.

second-rank demiurge, who copies what he sees God the Father doing (the language of *paradeigmata*, *archetypa* and *eikona* is deployed).[119]

My sense is that Christianity gave (even more) currency to the idea of design and production as a positive, powerful, prestigious activity; and that it provided this idea with a counterpart in the real world – churches – where the analogies microcosm/macrocosm, architect/demiurge could be realized and legitimized by the assent and participation of the community. One could go as far as saying that, partly through the demiurge analogy, architecture was sanctioned in late antiquity as the Christian *ars* or *techne par excellence* (alongside perhaps medicine), that building was pious as well as prestigious, and that the architect was a good enough model to serve as an image for the emperor, and even for God himself.[120] Take another intriguing group of archaeological sources, all featuring *ktisis*.

The personification of *ktisis* starts to appear in mosaics from the third century AD onwards: she is represented as a woman, elegantly, sometimes luxuriously, dressed, often with a diadem, as in fig. 5.3, which comes from the so-called villa of Eustolios, a large house that included its own baths at Kourion in Cyprus, and can be dated to the early fifth century AD.

Notice the measuring rod with very definite, very visible pointers.[121] The earliest example of the motif is in a fourth-century villa from Antioch-on-the-Orontes. Surrounding beautiful mosaics with mostly mythological scenes, some border panels depict birds with floral motifs and four busts of female personifications, labelled *ktisis*, 'renovation' (*ananoesis*, almost completely destroyed), 'power' (*dynamis*) and 'courage' (*euandria*). *Ktisis* holds what looks like a measuring rod, with a visible pointer at one extremity. There is a similar example from the later fifth or sixth century, from the so-called House of Ktisis in the same city, as well as two more, slightly different fifth-century examples, this time with no instrument, one of them paired with a personification of *ananeosis*.[122] There is a further massive example of personification of *Ktisis* in the Metropolitan Museum of New York, probably from the sixth century, and whose original context, like so many other ancient items in that museum, is specified only as from

[119] The motif reprised at Eusebius, *cit.* 10.4.55–6, 69–70 (he mentions the hyperuranian regions).

[120] Obviously, these themes are not exclusive to Christianity: see e.g. Himerius, *Orationes* 41.8, 16 and 11; Aphthonius (second half of fourth century AD), *Progymnasmata* 38–41, translated in McKenzie, Gibson, Reyes 2004: 105. The idea of God as the greatest architect of all is part of Jewish interpretations of the building of the Tabernacle and Solomon's Temple, see Boustan 2004: 200n. 19, 204 and 207, respectively.

[121] I thank Denise Sumpter for the use of the image, and Glen Bowersock for alerting me to the existence of these mosaics. See Nicolaou 1968: 32.

[122] Levi 1947: I 248–9, 253–6, 346–7; Campbell 1988: 5, 27.

Figure 5.3 Mosaic of *ktisis*: courtesy of Denise Sumpter.

'Asia Minor'. Once again, we have a bejewelled woman holding a measuring rod, this time with a smaller-size man holding an oversize cornucopia and the word 'good', perhaps the remaining half of 'good wishes'.[123]

Apart from wealthy private buildings, mosaic depictions of *ktisis* appear in another context: churches from Justinian's time. The nave of a church in Qasr-el-Lebia in Libya contains fifty panels, three of which represent *ktisis*, 'ornament' (*kosmesis*) and *ananeosis*. The panels with *ktisis* and *kosmesis* flank a panel with 'the new city of Theodora', which in its turn is on top of the panel with *ananeosis*. The three panels with personifications, in other words, form a triangulation around the panel with the city. The central panel has an inscription with the dedicatee of the church, and the central strip of panels further includes the façade of a building, perhaps another

[123] The image at www.metmuseum.org/toah/ho/06/wae/hod_1998.69,1999.99.htm (last accessed on 7/9/2006).

church, and the Pharos of Alexandria (at the bottom level). Next to the Pharos is a ship, and one other panel (down one level from the picture of the church, and to one side) depicts a fortress. The remaining panels have animals, personified rivers and springs, a shepherd, a faun and a merman.[124] *Kosmesis* and *ktesis* (*sic*) also figure on the nave floor of a church in Ras-el-Hilal, again in Libya.[125] The Libyan mosaics are quite different from one another: while the personifications in Qasr-el-Lebia are on a par with the other images in the mosaic, although they form a strong cluster of architectural imagery, the panels in Ras-el-Hilal are larger than the others, and in a more prominent position, flanking the approach to the chancel of the church. In Qasr-el-Lebia, *ktisis* is veiled, bejewelled, holding a branch and what could be a coiled rope (or a wreath) in one hand and a white stripe in the other. The figures in Ras-el-Hilal have no objects, and hold their hands up in a gesture of prayer or praise.

The interpretation of all these figures has been the object of some discussion: what does *ktisis* mean?[126] It could denote foundation, of a city or a building; it could be building – that is, architecture; or it can be interpreted as creation or even *the* Creation. Especially when *ktisis* is found in churches, I am inclined to think that all of these meanings should not be seen as mutually exclusive. To inscribe the floor of a house with a highly dignified figure of building and foundation may have had a propitiatory function, particularly in the case where the personification is accompanied by a horn of plenty. The associations with other images are also interesting: in Qasr-el-Lebia, if *ktisis* is both creation and building, both of the church and of the new city of Theodora, then *ananeosis* can be renewal as brought about both by God to the soul and by, perhaps, the emperor to the empire, precisely as advertised by Procopius in *Buildings*.

In other words, the various representations of *ktisis* from this period and its crossing over from religiously unspecific or pagan contexts into strictly Christian ones, is yet another indication of the phenomenon I have called, in the title of this section, the spiritualization of architecture. Gregory of Nyssa has already provided a good example that Christianizing architecture also meant installing new figures as commissioners, sponsors and designers. Changes in the control over public architecture are a good indication of

[124] Alföldi-Rosenbaum and Ward-Perkins 1980: esp. 33–7, 40–1, 121–33.

[125] Alföldi-Rosenbaum and Ward-Perkins 1980: esp. 40–1, 140–1. There is a further example of *ktisis, kosmesis* and *ananeosis* on the mosaic floor of a small chapel at Tokra in the area of Cyrene, dating to the sixth century AD, see Stucchi 1975: 427–8.

[126] Cf. Stucchi 1975: 401 and n. 3 with earlier references.

changes in the configurations of power. Let me give another example of a clergyman involved in building.

Athanasius, bishop of Alexandria, wrote a speech around AD 353 to defend himself against various accusations in front of the emperor Constantius. Some involved more straightforwardly political troubles (for instance, that he had exchanged letters with the would-be usurper Magnentius); but he also stood accused of having celebrated mass in a church that had not been finished yet.[127] This last matter was, in fact, also a political issue, in that celebrating mass officially inaugurated a church, and the emperor, who was usually called to inaugurate important churches, had not been called to the opening of this one. Athanasius appeals to matters of security: that particular day the faithful were too many, they were clamouring and he feared for their safety, since the alternative would have been to celebrate mass in the desert, outside the city, under the blazing sun.[128] The contrast between churches and 'outside space' runs throughout his apology:

> Where would it have been proper to have the people pray: in the desert or in an edifice of stone? Where would it be convenient and holy to have people answer amen? In the desert or in a place that carries the name of the Lord? [. . .] where would you have liked to see the people join their hands together and make vows for you? Outside, where even the pagans can stop and look, or in a place that has your name, a place that everybody already calls, since its foundation, the house of the Lord? [. . .] In the desert there are no doors, everybody is free to come and go. The house of the Lord on the contrary has walls and doors; it marks the difference between the people of God and the profanes.[129]

The image of the church as defining an outside and an inside, at the same time as identifying a civilized, urban space, speaks volumes here.[130] Although church-building was probably the main, it was by no means the sole architectural activity promoted and sponsored by bishops: they took over the role traditionally fulfilled by provincial elites in this, as in many other areas, and looked after water supply systems and fortifications as well. We find Christian leaders, including saints, taking on the role of military leaders in extreme situations.[131] The account of the miracles of

[127] Athanasius, *Apology to Constantius* 14–17. He was bishop at Alexandria between AD 328 and 373, with some interruptions.

[128] Athanasius, *cit.* 14. [129] Athanasius, *cit.* 16–17.

[130] See Spieser 1995, which is in particular on church doors. Christ himself is sometimes assimilated to a door.

[131] Evagrius, *Historia ecclesiastica* 4.27 describes a siege of Edessa in AD 544 at the hands of the Persians led by Chosroes. In general, see Ward-Perkins 1984: ch. 7; Avramea 1989; Feissel 1989; Lepelley 1998.

St Demetrius includes the siege of Thessalonika in Macedonia by the Avars in AD 586, where the inhabitants find themselves in *amechania*. The barbarians build several siege machines, from towers to stone-throwers, but God, through Demetrius, counters them with a *mechane* of his own. The devil then intervenes with some counter-*mechanai*, but he is inevitably defeated. The religious clash of good and evil has thus almost been turned into a contest of technologies.[132]

CONCLUSION

Late antiquity saw the slow, glacier-like transition from a 'soft' to a 'hard' form of imperial administration.[133] To the extent to which architects were representatives of the government, through the administration or the military, this change and the consequent increase in prestige or clout accrued to them too, and may have been a contributing factor to the change in image and status of architects I have argued for earlier in this chapter. Another phenomenon that has been identified as characteristic of late antiquity is the increasing autonomy of local communities. We have observed examples of architects well embedded in even small communities, as well as clusters of building experts, at various levels, in places that would appear quite remote from the centres of action. Further, late antiquity saw the rise of Christianity, which created a demand for new buildings, for a steady supply of experts able to produce them, and possibly for distinctive architectural styles, such as the vault.[134] Christianity also meant more competition for the leading role in communities: not only between local authorities and imperial administration, in their various permutations, but also between bishops and other clergy.

Control of buildings was a crucial point, and a potential battleground: according to Procopius, a church could be erected *ex novo* or repaired only with imperial funds, so effectively Justinian strove to establish a monopoly of church building, fending off competition not just from bishops, but also other members of the ruling class.[135] In a story reported by the fifth-century historian Priscus, Cyrus, a praetorian prefect and city prefect who was also a philosopher, had a special interest in buildings. He took care of them; in fact, he renovated the whole of Constantinople. So, while he was watching

[132] *Miracles of St Demetrius* 127, 130, 139, 140, 145, 149.
[133] Kelly 2004. [134] Kapitän 1969; Buchwald 1984 and 1995.
[135] Procopius, *Aed.* 1.8.5. Ward-Perkins 1984, outmoded for some aspects, contains very useful appendices listing evidence relative to building in Northern and central Italy, AD 300–850.

the circus races with the emperor Theodosius, the populace hailed him as the restorer of the city. As a result, Theodosius stripped Cyrus of his office, confiscated his property and sent him into exile.[136]

There could be clashes between religious and political authorities, as in the case of Athanasius, or in that of another bishop.[137] Gaza, AD 402: Porphyry, ever active in the fight against paganism, wanted to build a new church and hired Rufinus, an architect from Antioch, a 'reliable and knowledgeable man'.[138] But, crucially, when it came to determining the church design, the empress Eudoxia herself stepped in, and sent a *schema* which went into some fine detail, including how big the columns had to be. Rufinus, and we imagine Porphyry, were left with no option but to follow the imperial blueprint.[139]

The most intriguing woman builder of all has to be Anicia Juliana, a descendant of Theodosius, whose name is linked to the church of St Polyeuktos in Constantinople, built around AD 524–7 and probably topped by a large dome. A long epigram (or two related poems) carved along the front and the nave of the church celebrated her achievement and her family, and favourably compared the new building not only to the older one on the same site, but also to the temple of Solomon itself. The church is described in terms that draw parallels to the cosmos, and the decoration is likened to a meadow, just like in Procopius' description of the interior of Hagia Sophia. Most interestingly, there are several references to Juliana's direct and personal involvement: she has built the church 'by her righteous sweat' (16), the work is the sign of her 'pious hands' (24), 'her hand (*palame*)' has made many houses dedicated to God (30).[140]

It is rather unlikely that Anicia Juliana's hands went anywhere near the bricks or mortar that were employed in the building of St Polyeuktos. As in the inscriptions to which I directed attention in the first section of this chapter, the repeated insistence on personal involvement must signal something else than its literal meaning. Sponsors of buildings advertised their role in the early Empire as well, but they do not seem to emphasize this kind of actual, hands-on participation as much as the fact that they paid for the edifice, or took good care that the whole process went

136 Priscus, *Historia* fragment 8 (Blockley).
137 See Sotinel 1998: 115–17.
138 Marcus Diaconus, *Vita Porphyrii* 78. Marcus was a contemporary of Porphyry.
139 Mango 1976: 27.
140 Harrison 1986: 4–10, 406–11. The whole epigram in *Anthologia Palatina* 1.10, with scholia describing its position in the church. Excavations have found fragments of the original inscription. Anicia Juliana also commissioned the Vienna manuscript of Dioscorides, and her portrait adorns the front page.

smoothly. If indeed late antiquity ushered in a more prestigious, even more spiritualized public persona for architects, then it would make sense that people associating themselves with a building would want to take on the mantle of the technical expert as well. Again, think of Justinian and Anthemius and Isidorus, or of Justinian and another *mechanopoios*, Chryses of Alexandria.

Chryses had been helping Justinian restructure the fortifications at Daras. At some point, however, the river flooded the city, exposing a major strategic weakness, and the technician, unable to find a solution, went to bed distressed. He fell asleep and had a dream, where some unspecified superhuman being gave him a solution (*mechane*) to the problem. Assuming the suggestion had come from God, Chryses immediately sent word to the emperor, together with a sketch of the instructions given to him in the dream. Meanwhile, Justinian was in another city, consulting Anthemius and Isidorus about the very same flood problem. Oddly enough, he came up with a sketch identical to Chryses', before even seeing the one that the mechanician had sent him. The arrival of the messenger only confirmed the emperor's divine inspiration. Procopius concludes that the architects had to consider 'how God becomes a partner with this emperor in all matters which will benefit the State. So the emperor's command prevailed, while the knowledge and *techne* of the mechanicians yielded place to it'.[141]

This is an interesting case of what we could call independent discovery. The situation where the researcher, exhausted and desperate, goes to sleep still thinking about the elusive solution, which then comes to him in a sleep-induced epiphany, is a *topos* of the history of science. More unusual is the fact that, once Justinian has himself made the (strictly speaking, later) discovery, the role of Chryses is practically erased. The reality behind Procopius' story is foggy: if there is a substratum of real facts, my guess would be that we are reading a reconstruction of how Chryses' brilliant idea was appropriated by Justinian. The former's superhuman dream inspiration may have been a real episode; the latter's last-minute snatching of the prize sounds more like an *a posteriori* reconstruction, and perhaps Procopius lets us read between the lines deliberately. We have in effect another, rather luckier, Apollodorus, eliminated from the picture because his expertise is appropriated by the ruler. And why would Justinian want to pass for an architect? Several reasons have already been given, but let me

[141] Procopius, *Aed.* 2.3.13–14. The whole story at 2.3.2–15; God as Justinian's partner also at 5.3.10, 6.5.6. Cf. Cameron 1985: 108.

add an extra element: competition. The son of Anicia Juliana, she of the church of St Polyeuktos, was a candidate for the throne before Justinian (whose descent was not exactly illustrious) succeeded in his bid for power. Her family remained influential and visible, and it is interesting that Procopius omits mention of St Polyeuktos in his description of the sacred buildings of Constantinople.[142] To the various reasons for Hagia Sophia to have such a huge dome, we could even add the desire to outshine the dome of Anicia Juliana's church.

In a certain sense, Hadrian (allegedly) killed Apollodorus out of respect for his technical superiority – he could not stand being proven wrong on points of architectural expertise. Justinian did not kill Chryses or Anthemius and Isidorus, but reduced them to the role of secondary, subordinate figures – minor semigods to his demiurge. Precisely at a point where changes in the administration and circumstances of the empire, but above all the rise of Christianity, had imbued architecture with greater spiritual significance, Justinian reasserted his proximity to God and to the buildings celebrating him and ensuring order in the empire, by not simply paying or supervising (as in the early Empire), not just 'making' or even 'putting his hands' to the work, but by being a better architect than the architects themselves.

[142] Cameron 1985: 104.

Conclusion

In many ways, this book is unfinished, but that is not necessarily a bad thing. Perhaps the most significant theme I leave practically unexplored is the relationship between economy and technology. As I mentioned in the introduction, a certain view of this relationship was behind the *blocage* question – a historiographical approach which is dead in the water, but has left the field open for a new analysis of the issue. A new study of the relationship between technology and economy should take its steps from the consideration that neither economy nor technology follow absolute laws, and thus have to be seen as deeply embedded in a certain time and place. It would aim at a 'thick' description, factoring in the conflictual and dynamic character of its subjects.[1] Also, in my view, it would ideally redefine technology and economy in ways that are closer to the ancients' own categories, where technology was more than water-lifting machines, and economy was not only producing grain but more generally 'house-keeping', i.e. activities aimed at the maintenance of a certain life-style, be it mere sustenance or luxurious *otium*. In that sense, one thing that has definitely emerged from the various case-studies in this book is that the ancients did realize the *necessity* of technology, and with it the indispensability of technicians, for what both us and them would have recognized as the economy. What consequences this realization had for technicians, non-technicians and the articulation of their relationship has been one of my themes throughout.

On a smaller scale, in chapters 3, 4 and 5 I have scratched the surface, but not fully deployed the masses of epigraphic and archaeological evidence relevant to ancient technology that are available to us. It would be interesting, for example, to work on the iconography of a different funerary symbol (the ship, the compasses), or on funerary representations of a group of technical practitioners (smiths), or on funerary evidence for

[1] Wilson 2002 is a seminal paper in this respect; I also found Greene 2000 very inspiring.

technicians from one locality only (opportunely chosen: Ostia, Rome, Gallia Narbonensis) over a stretch of time. Similar possibilities are open for studies of architects and builders that would be more localized than chapter 5 (I have only given a taste of the evidence there is for Syria, for instance), or for a study that followed a different category of professionals – doctors, for instance – through late antiquity. As far as the epigraphic material is concerned, on land-surveying alone (not confined to boundary disputes) the possibilities are practically endless. Let a thousand history-of-ancient-technology flowers bloom.

This being the conclusion, it also seems like a good opportunity to give some semblance of unity to my string of chronologically arranged case-studies, and tie up some threads that have been running throughout this book. I would like to draw three principal conclusions (apart from the more modest, and implicitly safer, small-scale arguments that the reader will find in the previous chapters).

The first general conclusion is that ancient technicians, so often described as marginal to ancient society, were, if anything, often marginal-*ized*. We find phenomena such as the misrepresentation or biased reconstruction of the role of technicians in society, their elision from the picture, leading to their invisibility, and sometimes even the appropriation of their function. The attitude ancient sources (including those by the technicians themselves) had to *techne* or *ars* was hardly ever neutral or innocent, perhaps precisely because of the inescapable economic significance of technology which I mentioned earlier. For a parallel, look no further than ancient agriculture – most historians today would agree that the image of agriculture emerging from our Greek or Latin textual sources is a cultural construction, the result of a significant rewriting of reality. Nobody would claim that the particular flavour of agriculture one gets from Columella or Hesiod is downright 'reality', and I am claiming the same for ancient technology. Last but not least, the marginalization of technicians by some of the ancient sources has been compounded by their marginalization at the hands of modern historians, who have chosen to accept some representations of ancient society as relevant, interesting or more representative than others.

My second main conclusion is that the marginalization of technicians, which was also expressed as fear or mistrust of technical knowledge and of its exponents, catalyzed and was due to wider political and social issues. That applies also in cases when elision, reconstruction, appropriation were symbolic and literary rather than actual or concrete. A crucial factor, in my view, was the association of *techne* and technicians with change, mobility, mutation, passage from one state to another. It is in the very nature of

techne or *ars* that they are taught and learnt, acquired rather than innate, and it is in the nature of technicians to be resilient, resourceful and, well, crafty. All those connotations were directly or indirectly contrasted with alternative and powerful value systems, which privileged things one was born with or things that did not mutate (nobility, some virtues and dispositions, lineage, natural constitution). This contrast was ingrained in, and ran parallel to, social, political, and consequently moral, distinctions. Thus, my second main conclusion is that ancient discourses about *techne* were also about politics and society, not only because of a substratum of real political or social conflict, but also because at a symbolic level technical knowledge and technicians implicitly raised questions and exposed fault-lines in the view some social groups had of themselves and the world.[2]

My third and final conclusion is that, especially given the nature of the evidence, the history of ancient technology, and possibly other fields of ancient history as well, would greatly benefit from adopting what could be called a modified standpoint epistemology approach.[3] To put it simply, standpoint epistemology is an originally feminist approach to the philosophy of science, according to which there is no absolute objectivity in our description of facts or our formulation of laws of nature. Hence, there is no absolutely objective point of view, or standpoint, such as that allegedly held by modern science, from which to observe reality. A person's or a group's 'situatedness' – the circumstances under which they observe reality and articulate a description of it – will definitely affect such observation and the relative description. Someone's view on reality is always a view – or a stand – from somewhere, and choosing one standpoint over another is a matter of values dominant in a society, power balances, societal needs and constraints, rather than a neutral decision whose process can stake a legitimate claim to full rationality.[4]

Standpoint epistemology is about science; one does not even have to be a card-carrying relativist to see the applicability of some of its insights to ancient history. Technology gives the impression of being about 'facts' and

[2] I tend to assume no sharp separation between *techne*-the-knowledge and technicians-as-people identified on the basis of that knowledge. The idea that attitudes and reactions to a form of knowledge cannot be disassociated from attitudes and reactions to the repositories of that form of knowledge, and their political and social status – even when (especially when) such association is denied by the historical actors themselves – is a basic tenet in the history of science and technology. For a classic expression of this, see Shapin and Schaffer 1985.

[3] She wouldn't remember and cannot be held responsible for it, but I owe this idea to Indrani Chatterjee.

[4] For classic formulations of this see Fox Keller 1985 and Longino 1990.

'reality', and perhaps for that reason the history of ancient technology has suffered, I think, from a distinct lack of recognition of the existence of standpoints. For instance – and I return to my first conclusion – the whole idea that ancient technical knowledge was marginal derives from the acceptance of basically one point of view as the objective description of what really happened – as the view-from-nowhere. We may instead have to be contented with partial, overstated, partisan, often confused and confusing views-from-somewhere – with representations from a particular perspective, which is exactly what we have found as we examined our various sources in the course of this book.

In this sense, we can turn ancient history into a sharper challenge to explore – and push – the limits of what we may know about the past. There is enough overlap in our sources to give us at least some solid ground to build on and avoid the fall into complete relativism: we can rest assured that Julius Caesar was assassinated, even though we may never know for sure what his last words were. But, once we have established whatever solid ground our evidence allows, what remains is an attempt on the part of the historian to reproduce, or at least intimate, the complexity of the many voices emerging from the sources, be they in the form of a beautifully crafted philosophical dialogue or an inelegantly hewn slab of stone.

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Bibliographical essay

This essay is meant to provide an introduction to the general topic of ancient technology, and to supply bibliographical information other than that contained in the footnotes. As I have said at the beginning, my take on ancient technology is somewhat idiosyncratic. This bibliographical essay is no exception: what follows is by no means exhaustive of the available literature on technicians and technical knowledge in antiquity. At the same time, it should point the reader in slightly more traditional directions than the book does, and is consequently subdivided in a more traditional way. I have tried to select material that would be available in a medium-sized specialist library, and to avoid the exceedingly technical. That, as a consequence, this essay is all rather brief, is only further confirmation that more work is sorely needed by historians committed to taking the history of ancient technology out of the specialist's closet.

GENERAL

At the time of writing, my one desert-island ancient technology book would probably be Burkhard Meißner, *Die technologische Fachliteratur der Antike. Struktur, Überlieferung and Wirkung technischen Wissens in der Antike (c. 400 v. Chr.-ca. 500 n. Chr.)* (Akademie 1999). It is useful and thorough, and has very good coverage period-wise, since it stretches from classical Greece to late antiquity; subject-wise it unusually includes medicine, poliorketics and agriculture alongside architecture and mechanics. Moreover, it constitutes a good introduction to previous historiography and bibliography, with an eye to related publications in science and technology studies. On the downside, Meißner's book does exactly what the title says, i.e. it deals exclusively with literature, rather than material culture or technical artefacts of any kind.

The grandfather of historians of ancient technology is Hermann Diels, whose *Antike Technik* was first published in 1914 and again, in a revised second edition, six years later (Teubner 1920). Diels believed that ancient and modern technology had much more in common with each other than they did with medieval technology, or than was normally recognized. He was determined to emphasize such continuities in an effort to heal the increasing rift between science and the humanities that characterized the intellectual milieu in which he was writing. In the introduction to the second edition, written after World War I had been

disastrously lost by Germany and its allies, and in response to some classicists who had reviewed the first edition of *Antike Technik* and had criticized the juxtaposition of Philo of Byzantium and Hero of Alexandria with the likes of Sophocles and Pheidias, Diels wrote:

> With regard to such regrettable biases, one should be reminded that our times, and above all our poor fatherland need more than ever men who keep an eye on both directions of the human spirit. Now it is necessary to bring together all our strengths, the idealism of our classics and the realism of our technical heyday. Otherwise Germany and with her the culture of the whole world go to ruin! (viii)

The essays contained in Diels' book dealt with topics, some of which have since become classical features of similar texts: steam machines, military technology, time-keeping devices and the relationship between ancient science and technology. A slant towards engineering and machine-building can already be detected – this is after all what *Technik* mostly denoted at the time: artefacts. Such early twentieth-century accounts in a sense already sanctioned the exclusion of less tangible transformations of reality (e.g. medicine producing health, rhetoric producing persuasion) from the mainstream of history of ancient technology.

Today Diels is interesting primarily for what he can tell us about classical scholarship at the turn of last century, and as a testimonial of the enduring political resonance of the history of ancient technology. For a general introduction to, and accessible information on, the topic, readers can refer to a number of other books: still popular is R. J. Forbes, *Man the Maker. A History of Technology and Engineering* (Constable 1950), which is synthetic, readable and focused on the relationship between technology and civilization. Bertrand Gille, *Les mécaniciens grecs. La naissance de la technologie* (Éditions du Seuil 1980), also synthetic and readable (if not always accurate), concentrates instead on issues of accumulation of knowledge, formation of technical traditions, and the relationship between science and technology. It also devotes a whole chapter to 'Le blocage', with references to earlier secondary sources. K. D. White, *Greek and Roman Technology (* Thames and Hudson 1984*)*, is well illustrated, and contains a useful chapter on 'Sources of information', as well as several appendixes, some of which bring the history of technology to bear on economic history. A similar conjuncture between history of technology and economic history is the unifying principle behind the rather mixed bag of essays contained in Emilio Gabba (ed.), *Tecnologia economia e società nel mondo romano* (Como 1980). My favourite contribution, again because it lays bare the intersections between politics and the history of ancient technology, would have to be that by Gianfranco Miglio, perhaps better known as one of the most extreme ideologues of the Italian Northern League. He delivers a particularly turgid treatment of the *blocage* question, where the economic and political challenges facing the ancient world are equated with those posed to modern Europe by the oil-rich Middle East, at least until 'those people' run out of oil and 'go back to breeding goats' (19). Much better balanced, and also in Italian, are *Tecnica e tecnologia nelle società antiche*, by Alessandra Gara (Nuova Italia 1994), and *La tecnica in Grecia e a Roma* by Giusto Traina (Laterza 1994). Finally,

mention should be made of the again necessarily synthetic, but very well balanced and informative Helmuth Schneider, *Einführung in die antike Technikgeschichte* (Wissenschaftliche Buchgesellschaft 1992).

Accounts that go beyond Greece and Rome include the encyclopaedic, if outdated, *A History of Technology* (Clarendon Press 1954–6, the first two volumes, edited by Charles Singer and A. Rupert Hall among others), the richly illustrated, if often inaccurate, *Technology in the Ancient World*, by Henry Hodges (The Penguin Press 1970), and in particular *Hommes et techniques de l'antiquité à la Renaissance* (Colin 1993), which includes a chapter on China. Marie-Claire Amouretti (co-author with Georges Comet, who is a specialist on medieval technology) makes there a remarkable, if necessarily succinct, attempt at setting ancient technology in its cultural and institutional context, and at integrating it within the wider field of ancient science and philosophy. She also pays welcome attention to general issues of expertise.

Good historiographical summaries, some of them useful from the point of view of the history of ancient technology, if not for the sometimes outdated bibliographical information they contain, include the explicitly critical K. D. White, 'Technology in classical antiquity: some problems', *Museum Africum* 5 (1976), 23–35 and H. W. Pleket, 'Technology in the Greco-Roman world. A general report', *Talanta* 5 (1973), 6–47. More recently, we have G. W. Houston, 'The state of the art: current work in the technology of ancient Rome', *The Classical Journal* 85 (1989–90), 63–80, which is an essay review of five books, including K. D. White's, and Kevin Greene, 'Perspectives on Roman technology', *Oxford Journal of Archaeology* 9 (1990), 209–19, as far as I am concerned *the* last nail in the coffin of the *blocage* question.

Longer bibliographies in M. Feugère *et alii*, *Bibliographie Instrumentum 1994–2001* (Mergoil 2001), with an almost exclusive archaeological slant, and (for material until c. 1985) John Peter Oleson, *Bronze Age, Greek and Roman Technology. A Select, Annotated Bibliography* (Garland 1986). Oleson's annotated bibliography is divided into: sources, general surveys, chapters on mining, food production, machines, construction and civil engineering, manufacturing, transportation, record-keeping, military technology (but N.B. siege engines are in the chapter on machines in general), and cultural attitudes towards technology. A not too dissimilar division characterizes John W. Humphrey, John Oleson, and Andrew Sherwood's *Greek and Roman Technology: A Sourcebook* (Routledge 1998), a good starting point for readers who want exposure to what there is out there in terms of textual sources (including a few inscriptions and papyri).

For an idea of what there is out there in terms of archaeological material, good starting points could be Gerhardt Zimmer's *Römische Berufsdarstellungen*, (Berlin 1982) or the brilliantly illustrated catalogues of recent exhibitions at the Museo Archeologico Nazionale in Naples: A. Ciarallo and E. De Carolis, (eds.), *Homo Faber. Natura, scienza e tecnica nell'antica Pompei* (Electa 1999), and E. Lo Sardo (ed.), *Eureka! Il genio degli antichi* (Electa 2005).

At the time of writing, John Oleson is preparing, with the help of many contributors, a *Handbook of Ancient Engineering and Technology* for Oxford

University Press, that should provide the ideal companion to the Humphrey/Oleson/Sherwood sourcebook, and constitute a good first-stop for readers new to the subject.

CRAFTSMEN AND TECHNICIANS

Beyond the obligatory mention of Archimedes, Hero and Vitruvius, many general accounts of ancient technology are more concentrated on the achievements (or lack thereof) than they are on the people. An early partial exception is L. Sprague de Camp, *The Ancient Engineers* (Doubleday 1960), which covers Egypt, Mesopotamia and to a lesser extent China, India, and the Western Middle Ages as well. Alison Burford, *Craftsmen in Greek and Roman Society* (Thames and Hudson 1972) is a balanced account, which is still very informative. A useful study is also Lutz Neesen, *Demiurgoi und Artifices. Studien zur Stellung freier Handwerker in antiken Städten* (Lang 1989). For the rest, one has to look in various places: articles or remarks about technicians and craftsmen in the Greek and Roman worlds are scattered in journals or publications about economy, slavery, archaeology, architecture, agriculture, public associations, but no real successor to Burford's book appears to have emerged.

If we look at the specific category of architects, however, more is available on them as a professional group. From the relatively rich material, sometimes contained within general histories of architecture, let me single out James Anderson, *Roman Architecture and Society* (Johns Hopkins University Press 1997) and Janet DeLaine, 'Building the eternal city: the construction industry of imperial Rome', in J. Coulston and H. Dodge (eds.), *Ancient Rome. The Archaeology of the Eternal City*, (Oxford 2000), 119–41. On a related professional group Michael Donderer, *Die Mosaizisten der Antike und ihre wirtschaftliche und soziale Stellung: eine Quellungstudie* (Erlangen 1989) is qualifiedly useful, just as his *Die Architekten der späten römischen Republik und der Kaiserzeit: epigraphische Zeugnisse* (Erlangen 1996), on which I have extensively relied for chapter 5.

ENGINEERING AND MECHANICS

Some historians of ancient technology explicitly restrict their field of enquiry to engineering. Given that there was no exact Greek or Roman equivalent of our modern 'engineer' (a term on which there is still debate today: an electronic engineer is very different from a chemical engineer. Also, is an engineer a scientist or not?), what is generally covered by that label is machines, water supply systems, including water pumps, weight-lifting systems, catapults, means of transportation (especially ships) and sometimes architecture. The best handbooks on ancient engineering are also basically among the best handbooks on ancient technology: Donald Hill's *A History of Engineering in Classical and Medieval Times* (Routledge 1996, first published in 1984), a self-avowed 'technical history of engineering – social and economic factors are referred to only when they can throw light upon engineering developments' (xiii), which includes instruments and clocks and is particularly strong on Islamic technology, and J. G. Landels' *Engineering in the*

Ancient World (Constable 2000 – the first edition was in 1978), whose treatment of themes like progress is more historically sensitive than most. A. G. Drachmann, *The Mechanical Technology of Greek and Roman Antiquity* (Munksgaard 1963) deals mainly with the five simple machines (lever, pulley, wedge, screw and winch) and is quite judgemental on issues of progress and innovation, but it also contains a useful English translation of Hero of Alexandria's *Mechanics*, only extant in Arabic. As for Robert S. Brumbaugh's *Ancient Greek Gadgets and Machines* (Greenwood Press 1966), it remains immensely readable and full of little amusing observations. The best of the bunch in my opinion are the chapter by Ferruccio Franco Repellini, 'Tecnologie e macchine', in A. Schiavone (ed.), *Storia di Roma IV* (Einaudi: 1989), 323–68, and especially Astrid Schürmann, *Griechische Mechanik und antike Gesellschaft. Studien zur staatlichen Förderung einer technischen Wissenschaft* (Steiner 1991), which provides a rich and sophisticated analysis of many aspects of ancient mechanics in context, from the role of what Brumbaugh would have simply called 'toys' in banquets to the possible use of mechanisms in temples and religious ceremonies, to patronage of ancient technology in Hellenistic and Roman times.

Finally, readers may want to consult Donald Cardwell, *The Fontana History of Technology* (Fontana – now HarperCollins – 1994) for an example of ancient technology as seen by a historian of technology of other periods (one of Cardwell's principal areas is the Industrial Revolution). The introduction tackles issues such as pre-modern *v.* modern technology, the alleged switch from 'technics' to 'technology' and the role played in such a switch by the relationship between science and technology.

OTHER TECHNOLOGIES

Every year much material is published on what we could call technical sub-fields such as metal-working, or military equipment – for that the reader can consult standard reference works such as *L'année philologique* (online at http://www.annee-philologique.com/aph/), which has a section on *Technologie*, as well as sections on *Sciences et techniques physiques, de la terre* and *de la vie*. The great majority of what is published, however, is informative rather than analytical, and much more research is needed to transform what are often scattered reports of archaeological finds here and there into well-integrated histories that take into account issues of technical knowledge, self-representation of technicians and relationship with the society, economy, politics and religion of the time.

Serious steps in that direction have been taken in some cases, and among the liveliest sub-fields in the history of ancient technology today I would like to single out the history of water supply and the history of land surveying. Providing a comprehensive bibliography for each would be impossible, but interested readers can refer to the following for work on aqueducts, canals, irrigation, water-lifting machines, as well as the administration of water supply (I have limited myself to work mainly in English and on Rome): Christer Bruun, *The Water Supply of Ancient Rome. A Study of Roman Imperial Administration* (Helsinki 1991);

A. Trevor Hodge, *Roman Aqueducts & Water Supply* (Duckworth 2002², first edition was 1992), very readable but to be taken with caution when it comes to historiography; the very thorough Örjan Wikander (ed.), *Handbook of Ancient Water Technology* (Brill 2000); Gerda de Kleijn, *The Water Supply of Ancient Rome. City Area, Water, and Population* (Gieben 2001) and, most recently, the collection edited by Franco Minonzio, *Problemi di macchinismo in ambito romano. Macchine idrauliche nella letteratura tecnica, nelle fonti storiografiche e nelle evidenze archeologiche di età imperiale* (Como 2004). See also recent work on Sextus Julius Frontinus, below.

As for land surveying, more and more technical treatises are being translated into modern languages (again, see below) and archaeological studies continue to be conducted, in an effort to uncover traces of ancient land-division. For monoglot English speakers, O. A. W. Dilke, *The Roman Land Surveyors: An Introduction to the Agrimensores* (David and Charles 1971) is still very valuable, but the real meat will be in German and French contributions such as the articles in Okko Behrends and Luigi Capogrossi Colognesi (eds.), *Die römische Feldmeßkunst: interdisziplinäre Beiträge zu ihrer Bedeutung für die Zivilisationsgeschichte Roms* (Göttingen 1992) and the books by Gérard Chouquer and François Favory: *Les arpenteurs romains: théorie et practique* (Errance 1992) and *L'arpentage romain: histoire des textes, droit, techniques* (Errance 2001).

Also useful is the Routledge series on *Sciences in Antiquity*, especially Tamsyn Barton's *Ancient Astrology* (1994), my *Ancient Mathematics* (2001), Liba Taub's *Ancient Meteorology* (2003) and Vivian Nutton's *Ancient Medicine* (2004). Some persuasion will have to be applied before rhetoric fully enters the ranks of ancient technical knowledge, and I refer the reader to the encouragingly titled chapter three of Thomas Habinek's *Ancient Rhetoric and Oratory* (Blackwell 2005): 'The craft of rhetoric'. Let us hold our breath for the day when cooking, domestic bread-making and weaving, and suchlike potentially feminine crafts seep over from 'women's history' or 'gender studies' and enter the official history of ancient technology. In the meanwhile, the reader is referred to the (at the time) groundbreaking Natalie Kampen, *Image and Status: Roman Working Women in Ostia*, (Berlin: 1981) and especially to Eve D'Ambra's work, from *Art & Identity in the Roman World*, (Everyman Art Library 1998) to the forthcoming *Roman Women* (Cambridge 2007).

SPECIFIC STUDIES ON TECHNICAL AUTHORS

The list of monographs, or even just articles, on the main technical writers, is dotted with gaps, especially in some cases and especially in the English language. Leaving aside Archimedes and the medical writers, for bibliography on whom I refer the reader to Reviel Netz, *Ludic Proof: Greek Mathematics and the Alexandrian Aesthetic* (forthcoming) and Nutton's recent book (see above), respectively, we have for instance little on poliorketics writers. This trend may be reversed by the fact that there has been a relatively recent wave of translations into modern languages, such as D. Whitehead's *Aineias the Tactician. How to*

Survive Under Siege (Bristol Classical Press 2001², first edition published in 1990) and Apollodorus of Damascus' *Poliorketika* (Greek text and Italian translation, plus accompanying essays in A. La Regina (ed.), *L'arte dell'assedio di Apollodoro di Damasco*, Electa 1999). Apollodorus, the author of the *Poliorketika*, is traditionally identified with the architect with whose story I start chapter 5.

The little written on the art of siege becomes very little when we turn to Philo of Byzantium. The best overall survey of his work is still Gian Arturo Ferrari, 'Meccanica allargata', in G. Giannantoni and M. Vegetti (eds.), *La scienza ellenistica*, (Bibliopolis 1984), 225–96. The same (in fact, worse) goes for Biton: in the midst of growing scholarship on patronage and knowledge in Hellenistic times, the only aspect of Biton's relationship with his patron king Attalus that has attracted any attention so far is which Attalus we are talking about (M. J. T. Lewis, 'When was Biton?', *Mnemosyne* 52 (1999), 159–68).

Vitruvius, and to a lesser extent Athenaeus Mechanicus, have been much luckier: the former has been the object of constant, if not increasing, attention, ever since he started to be seen as 'not just' a technical writer or a repository of information about ancient architecture and engineering, but also as a privileged witness and participant in the transition from late Republic to early Empire. Apart from the on-going French edition with Les Belles Lettres at the hands mostly of L. Callebat, P. Fleury and P. Gros, we have new, annotated, translations in English (by Ingrid D. Rowland for Cambridge University Press 1999), and Italian (by A. Corso and E. Romano, with Latin text, Einaudi 1997). The most valuable recent contribution remains in my view Elisa Romano's *La capanna e il tempio: Vitruvio o dell'architettura*, (Palumbo 1987).

Vitruvius' contemporary, Athenaeus Mechanicus, has recently been given a new lease of life with an annotated English translation by D. Whitehead and P. H. Blyth (Steiner 2004, Historia Einzelschriften 182). New translations have also revived attention for the Roman land-surveyors: the magisterial work by Brian Campbell, *The Writings of the Roman Land Surveyors. Introduction, Text, Translation and Commentary*, (Society for the Promotion of Roman Studies 2000, Journal of Roman Studies Monograph 9) comes with the added bonus of appendixes listing, for instance, inscriptions reporting boundary disputes (on which I have extensively relied for chapter 4).

One of the authors in the *Corpus Agrimensorum Romanorum*, Sextus Julius Frontinus, is better known as the author of our main text on Roman aqueducts, also recently re-edited, with very comprehensive commentary, by R. H. Rodgers (Cambridge University Press 2004) and re-translated into Italian, with commentary and Latin text, by Fanny Del Chicca (Roma 2004). Of the literature on Frontinus, the reader may find more mileage in works that do not focus on whether his calculations of how much water flows through the pipes of various aqueducts are correct, but what place he and his activities occupied within the Roman society of the time. They include J. DeLaine, '"De aquis suis"?: The "Commentarius" of Frontinus', in C. Nicolet (ed.), *Les littératures techniques dans l'antiquité romaine. Statut, public et destination, tradition*, Genève: Vandœuvres 1996, 117–45; my 'Divide and rule: Frontinus and Roman land-surveying', *Studies*

in History and Philosophy of Science 31 (2000), 189–202; Michael Peachin, *Frontinus and the curae of the curator aquarum* (Steiner 2004), and above all Alice Weeks, who in her as yet unpublished doctoral thesis ('Ancient knowledge, Roman politics and Frontinus' "technical" treatises', University of Cambridge 2004) for the first time looks at Frontinus' *oeuvre* as a whole.

Finally, on Hero of Alexandria, apart from new translations of *Automata* (Susan Murphy in *History of Technology* 17 (1995), 1–44, unfortunately not very reliable) and *Pneumatica* (by Gilbert Argoud, Jean-Yves Guillaumin and Alain Cachard, Saint-Étienne 1997, with the Greek text), new material has regularly appeared in the various volumes edited by Argoud and Guillaumin for the Publications de l'Université de Saint-Étienne in 1994 (*Science et vie intellectuelle à Alexandrie*), 1998 (*Sciences exactes et sciences appliquées à Alexandrie*) and 2000 (*Autour de 'La dioptre' d'Héron d'Alexandrie*). Arguably the most interesting new interpretation of Hero, however, is by Karin Tybjerg, 'Wonder-making and philosophical wonder in Hero of Alexandria', *Studies in History and Philosophy of Science* 34 (2003), 443–66 (more at length in a book forthcoming with Cambridge University Press), who explores key concepts such as 'wonder' in the context of Hellenistic natural philosophy.

Index

accuracy 20, 22
Aeneas Tacticus 64, 68
Aeschylus 7, 38
agriculture 18, 166
Aizanoi 117–18
Alexander the Great 50, 71
Anicia Juliana 162, 164
Anthemius 132, 137
Apollodorus 131
Apuleius 105
Archimedes 45, 61, 62
architecture 134–7
Aristophanes 36
Aristotle 9, 12, 13, 18, 27, 30, 31, 67
artificiality 16
Asclepiodotus 65, 68
Asclepius 7, 23
Athena 38, 93, 96
Athenaeus 53, 62, 63
Athens 46, 63
Avidius Negrinus 114
Avidius Quietus 117
axe 96

bad technicians 30, 31, 33, 59, 68–9, 73
  Anytus 26, 36
  banausos 9, 10–11, 31
Biton 52–3, 63
blocage question 3–4, 42
body 9, 10, 32, 33, 39
Brâd, church of 142–3

Candidus Benignus 85, 91–2
Carthage 43, 53, 74, 103
Cassius Dio 131
catapult 41, 44–7, 55, 63
  Casalbordino cylinder 56
  Cremona catapult 54
  washers 49, 57–8
chance 18, 21, 51, 71
Christianity 139–40, 144, 152–61
Cicero 105
Constantine 148
Creole technology 56
Cuma 97
Cyrus 60

Daedalus 92
Daulis 119–20
Delphi 114–17
Demetrius the Besieger 47, 54, 61, 72–3, 75
Demosthenes 37
development, technological 7, 14, 17, 41–2, 46
  'fits and starts' model for 48
  linear model for 42, 47–8
  'scatter' model for 55–8
Diodorus 44, 58
Dionysius of Syracuse 43, 53, 58

economy 3, 135, 165
Egypt 84
ephebia 63
Ephorus 67
Euclid 139
Eudoxia 162
Eusebius 156
Eutocius of Ascalona 138
evidence
  archaeological 2–3, 135, 152, 153
  epigraphic 14, 114, 147
  funerary 79–83, 93
exactness 19, 20

foreigners 10, 32, 60
fortifications 43, 49, 67, 161

Galen 39, 77
Garlan, Yvon 48
general, art of the 18, 66–7, 70–1
Greene, Kevin 4
Gregory of Nyssa 155

Hagia Sophia 132, 137, 146
Harpalos 143
Hephaestus 38–9
Hero of Alexandria 53, 77, 138
Hippocratic treatises 14–17, 19–22, 27–9, 33–4
  Ancient Medicine 15, 17, 20, 35
  On Techne 9, 15, 16, 20, 28, 35

Isidorus 132, 137, 138
Isocrates 27

Justinian 132, 133, 137, 149–51, 161, 163–4

Kairos 18, 21, 70, 71
knowledge
  of causes 15
  of general principles 18, 19
  of signs 15, 17, 20, 22, 110
  manual 12, 14, 99, 141, 162
Ktisis 157–9

land-surveying 84, 107–13, 114, 118, 124–7, 129–30
  disputes 113–20
  groma 83, 109
  maps 109, 120, 124
Libella xi, 78, 84, 96–101
Livy 106
Lucian 105
Lysias 37

mainstream view 3, 4–5, 11, 101, 166
Marsden, Eric 47, 71
mathematics 13, 18, 65, 70, 75, 106, 111, 113, 124, 138
  duplication of the cube 84
mechane 13, 25, 49, 151
Mesopotamia 45
myth 25–6

Navy 43, 50, 60, 74

Ober, Joshua 12, 36
Onasander 65, 68, 70
Origen 154

Pausanias 115
Pericles 45, 59
Pettia Ge 85
Philip II of Macedonia 47, 49, 53, 59, 71
Philip V of Macedonia 66
Philo of Byzantium 51–2, 54, 61–2
philotimia 44, 50, 74
Phocaea 45
pilot, art of the 18, 31
Pimouguet-Pédarros, Isabelle 48
Pindar 7–8, 38
Plato 12, 14, 18, 22–6, 29, 30, 32, 36, 150
Plutarch 41, 72, 107
poliorketics 64, 68
politics 8, 12, 30, 36–8, 101, 167
Polybius 45, 66, 67, 70, 74
Pompeii 92, 97, 99
Procopius 131, 132, 133, 137, 149, 151
Prometheus 7, 37, 38–9
Protagoras 26, 27, 30, 31

ram 53
Rhetoric 35
Rhodes 46, 72, 75
Rihll, Tracey 48
Rome 74–5, 122–4
  laws 148–9
  Roman army 143
Russo, Flavio 48

sarcophagus, house-shaped 89–90, 154
semantics 9
Seneca 106
Severus Alexander 147
slavery 10, 31, 60, 78, 79, 85, 127
sophists 27
Sophocles 29
Sparta 41
standpoint epistemology 167
Symmachus 135

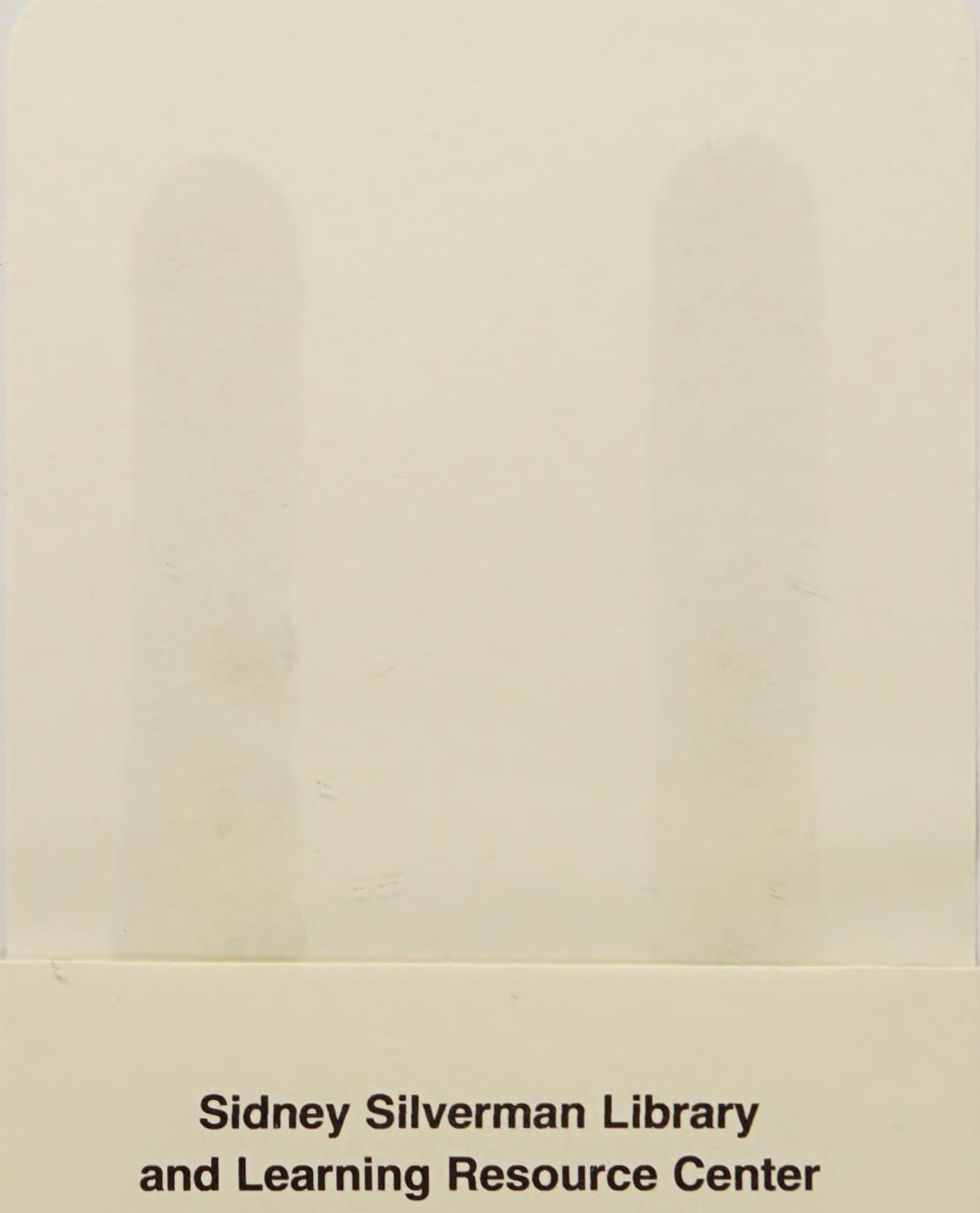
teaching 13, 22–9, 60, 63, 64, 69
Theodosius 162
Totem 97–8
Trebius Iustus 154

Valerius Maximus 105
Verona, relief from 85, 88–9
Victorinus 139–41
virtue 33–4, 69–70
Vitruvius 53, 62, 73, 75–6, 77

Whitby, Michael 151
women 10, 31, 78, 83, 120

Xenophon 9, 27, 60

Zanker, Paul 79
Zimmer, Gerhard 78



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Cover illustration: the Pompeii skull mosaic, opus vermiculatum, Museo Archeologico Nazionale di Napoli.

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